Syngenta's Comments on the EPA's January 19, 2001 "Atrazine: HED's Revised Preliminary Human Health Risk Assessment (and Associated EPA Documents) for the Reregistration Eligibility Decision (RED)"

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Executive Summary

Syngenta Crop Protection, Inc. received on Saturday, December 2, 2000 your letter of December 1 and a copy of the November 30 USEPA Preliminary Human Health Risk Assessment. On December 22, 2000, Syngenta provided a formal response (30-Day Comments) to the HED's Draft Preliminary Human Health Risk Assessment and associated documents. Syngenta received notice of an EPA Response to the Syngenta 30-Day Comments on February 14, 2001. The Revised Preliminary Human Health Assessment dated January 19, 2001 was also made publicly available on February 14, 2001. Provided in this document are Syngenta's 60-Day Comments on the Revised Preliminary Human Health Assessment .

In the revised preliminary risk assessment conducted for atrazine by the Agency, Syngenta disagrees with EPA's rationale on the following:

- Retaining the 10X uncertainty factor for extra sensitivity of infants and children when in fact, the most sensitive endpoint is from an adult rodent study.
- Utilizing a chronic toxicity endpoint (LH surge suppression) to characterize short- and intermediate-term hazard assessment.
- Using a chronic toxicity endpoint developed for adults to characterize risks associated with exposure of infants and children.
- The EPA estimate of the luteinizing hormonal (LH) endpoints: the chronic LH toxicological endpoint should be calculated using a "benchmark dose" approach. In the case of atrazine, the mode-of-action data has confirmed that the Fischer-344 rat is the most appropriate model for humans.
- Use of data from Syngenta Rural Well Study to characterize exposure from rural drinking wells in the 21 major use states.
- Use of the 5% default wet hand/turf transfer factor in the residential post-application exposure scenario.

In the revised preliminary human health risk assessment, EPA has acknowledged that the deterministic risk assessment conducted on diet and water is a conservative estimate of exposure. As part of these comments, Syngenta has provided a probabilistic assessment that characterizes the extent to which the deterministic methodology overstates theoretical risks arising from the aggregation of exposure to total chloro-triazines in diet and water. New information provided with this submission reduces uncertainty in the characterization of total chloro-triazine residues in water. The primary area of concern for human health risk, noted in the EPA's revised preliminary risk assessment, is derived from atrazine residues found in a small number of CWSs in surface water (24 CWSs out of 27,485 CWSs).

These CWSs have seasonal means or annual average concentrations above the Agency's proposed drinking water level of comparison for some sub-populations when using deterministic methodology. Syngenta is including in these comment, a probability-based distributional analysis of the exposures from these CWSs. Based on this analysis, it is concluded that the total chloro-triazine residues of atrazine in diet and drinking water do not pose a risk to individuals drinking water from the CWSs with the highest total chloro-triazine concentrations.

An additional area of theoretical risk, identified in the revised preliminary assessment, resulted from residential application and post application exposure to atrazine-treated turf. Syngenta has re-calculated the potential exposures for turf use, using toxicological endpoints and assumptions that Syngenta believes are the most scientifically appropriate for each specific use scenario. This analysis demonstrates that acceptable margins of safety exist for all of the exposure scenarios that can reasonably be expected to occur.

Additionally, Syngenta would like to use this opportunity to reiterate recent requests certain referenced documents or information sources that EPA did not provide with the preliminary risk assessment. The requested documents are:

1. The data sources and the weighting process used to estimate product usage.

2. Quantitative Usage Analysis dated May 10, 1999 from BEAD (as cited in the OREB Chapter, page 27).

3. EPA review memorandum of January 2000 by Ruth Allen on five published epidemiology studies, in the OREB Chapter, pages 11 and 60.

4. Details of atrazine human incidence reports.

The following sections provide Syngenta's comments on EPA's preliminary findings and conclusions. We are providing these inputs to EPA in order to develop the most scientifically valid risk evaluation for atrazine.

Syngenta respectively requests meetings with appropriate EPA scientists in the areas of toxicology (study designs for reproduction and fertility effects requested by EPA and selection and methodologies for short-term exposure toxicity endpoints), water assessment (statistical procedures for the synoptic groundwater CWS study results and risk assessment methodology), ecotoxicity (probabilistic risk assessment and ongoing studies) and label language clarification and harmonization of labels for all end-use products.

A. Drinking Water (Deterministic Assessment)

Surface Water

- Syngenta disagrees on a scientific basis with the development of seasonal means for comparison with chronic Drinking Water Level of Concern (DWLOC) for various sub-populations. The chronic endpoint on which the DWLOCs are based is an effect in the rat with onset after six months of treatment, which translates in terms of human exposure duration to an exposure period of many years. Annual or period means are much more appropriate for addressing exposure to atrazine in drinking water. Also, because of the decrease in atrazine concentrations in recent years, it is important to include the most current data from 1999-2000. Syngenta will recalculate deterministic and probabilistic exposure values, using surface water data from the last three years to better assess the trend toward lower concentrations and to a more accurately identify specific watersheds for future stewardship and implementation of Best Management Practices.

- Time-weighted means: The preliminary risk assessment did not use estimates of annual and seasonal (3-month) means for the Community Water Systems (CWSs) from the three databases used in the preliminary risk assessment. This results in an over- or under-estimation of the total chloro-triazine CWS annual and seasonal means, depending on the timing of sampling. The time-weighted procedure is required for the monitoring data in the Syngenta Voluntary Monitoring Program (referred to as VMS) and the Acetochlor Registration Partnership (ARP) databases due to the increased number of samples per year, with a greater number of samples obtained subsequent to the atrazine application period (May–July).

- Composite water database: The various databases (PLEX, ARP, VMS) should be combined prior to calculating seasonal and annual means. Time-weighting rather than simple averaging results in a statistically stronger and more robust data set for analysis of possible water concentrations. See Attachment 4 for a detailed discussion.

- Exposure period: Since these data sets span several years, time weighted means covering the same exposure duration as that being assessed in each exposure scenario should be determined (i.e. a seasonal mean should not be compared to a DWLOC for chronic exposure).

- Chronic drinking water exposure: The number of CWS exceeding 12.5 ppb in EPA Tables 10, 11, 13, 14 for annual and seasonal total chloro-triazine means should be re-examined with the proper time-weighted calculation of mean exposure for each time period. In addition, the total chloro-triazine period mean concentration for each of the CWSs in the three databases should be incorporated into the assessment. The period mean exposure concentration (based on an average of annual means for the number of consecutive years monitored) is the most accurate estimation of chronic exposure to the eight population subgroups. These data should be included to better and more accurately evaluate the CWS exposure profile for each of the population subgroups chronic DWLOC values.

- Stewardship: Syngenta is providing an overview of ongoing agricultural stewardship activities (Attachment 9).

Groundwater

There are two large-scale groundwater studies where atrazine, simazine and all of their chloro-triazine metabolites have been monitored:

1. Syngenta Rural Well studies for atrazine and simazine performed from 1992-1995

2. Syngenta Groundwater Community Water System study performed in 2000 (Attachment 10)

A discussion of these studies in relation to populations served by both CWS and rural wells and their relation to each other and to other data sources is presented in Attachment 6.

The following conclusions can be drawn from these discussions:

- In comparing temporal and special variability, special variation tends to dominate in those data sets that allow a 2-way ANOVA. As a result, these two Syngenta data sets can be used in a conservative risk assessment for drinking water obtained from groundwater sources even though limited re-sampling was undertaken in the rural well studies.

- A comparison of the rural well data to that obtained from the previous detect group of groundwater CWSs and to the groundwater CWSs where no detections of atrazine have occurred shows that all three groups of data are significantly different from each other.

- Therefore, risk assessments should be performed differently for CWSs and for rural wells and also for those wells with previous detections vs those with no history of atrazine detection. Extensive monitoring of atrazine by responsible state lead agencies, USGS and Syngenta for the past several years provide the data to conduct these different risk assessments.

- The rural well study was designed to focus on areas of extremely high vulnerability and a history of previous detections. As a result, this study represents the high end of exposure in the population that obtains drinking water from rural wells.

- Even though the rural well study was not designed to obtain temporal data, some of the wells were re-sampled as part of the study and Syngenta has just completed a re-sampling of all of the wells that exceeded the MCL for atrazine or the EPA proposed DWLOC of 12.5 ppb. All of the re-sampling data indicates that the residue levels are declining, supporting the conclusion that these higher level detects were the result of point source issues at the sites. None of the re-sampled wells currently exceeded the MCL on proposed DWLOC. Therefore, in general, data from these wells should not be used in a rural well drinking water risk assessment.

- The CWS groundwater study that was statistically designed based on the 1993-1998 PLEX data determined that exposure to total chloro-triazine residues is significantly different between the “previous detect” domain and the “domain with no history of atrazine detects.”

- The 95^{th} percentile of exposure to total chloro-triazine residues (including simazine) in the “previous detect” group is about 1.5 ppb or less, far below the most sensitive DWLOC of 12.5 ppb.

- The 95^{th} percentile of exposure to total chloro-triazine residues (including simazine) in the non-detect group is less than 0.1 ppb.

- These CWS data can be used to conservatively estimate exposure in all CWS since the Safe Drinking Water Act (SDWA) requires monitoring for atrazine in all areas where the CWS is vulnerable to atrazine exposure.

- Aerobic soil half-life: The most appropriate mean aerobic soil metabolism half-life value is 61 days as reported by the Atrazine Ecological Risk Assessment Panel in the report entitled, “Aquatic Ecological Risk Assessment of Atrazine – A Tiered Probabilistic Approach, A Report of an Expert Panel” (final report has been submitted to EPA as part of the Syngenta response to the Preliminary Environmental Fate and Effects Risk Assessment -MRID# 45299501). This half-life value should be used in the revised preliminary risk assessment.

B. Occupational Mixer/Loader/Applicator

- Aerial Applications to Christmas trees and conifer forests: Information from university experts and growers indicate that these types of application occur less than 30 days per year. In fact, no more than seven days of applying atrazine to Christmas tree farms would take place within a year by one applicator, resulting in only short-term risks and not intermediate-term risks. The preliminary risk assessment should be revised to only include a calculation for short-term risk.

- Bulk fertilizer: "On-farm" preparation of atrazine impregnated fertilizer is not done. Fertilizer pre-mixing is done in automated large-scale blenders. In addition, the assumption that 960 tons of fertilizer is impregnated with atrazine per day is not correct. Using information from major fertilizer manufacturers, an upper bound estimate for impregnating dry bulk fertilizer with atrazine would be 200 tons of fertilizer per day. Syngenta is submitting with this document a synopsis (Attachment 5 Appendix 3) that fully describes the bulk fertilizer impregnation process, possible exposure scenarios, and risk calculations. Included in Appendix 3 is a description of the liquid bulk fertilizer mixing process and risk calculations. When using these data regarding blender capacity and impregnation rates supplied by fertilizer companies, the potential risks to workers are well within acceptable margins of safety.

- Roadsides: Syngenta supports this use, but only at a maximum label rate of 1 lb. a.i./acre for roadsides in seven states; not at 4 lbs. ai/acre rate as noted in the document. See Attachment 2 for additional comments regarding use/usage and labeling of atrazine products.

- Flaggers: EPA has acknowledged that human flaggers will not be used when treating very large acreage. However, EPA includes human flaggers for flagging 1,200 acres of Conservation Reserve Program (CRP)/grasslands, corn, and sorghum (Table 9 of EPA's Occupational and Residential Exposure Assessment) in its current risk assessment. This scenario is unsupported by available data and needs to be removed. Also, the NAAA data being cited by EPA to support that 15% of aerial applicators use human flaggers is based on 1998 data and likely overestimates the percent of human flaggers used today given the rapid acceptance of GPS.

C. Occupational Post-Application

- The EPA has agreed that post-application exposure to workers hand-weeding sod or turf is unlikely at any time and that sod-harvesting shortly after a herbicide application would also be highly unlikely. Nonetheless, a risk assessment for these activities taking place within 12 hours of an atrazine application was conducted by the Agency (Table 13 of EPA's Occupational and Residential Exposure Assessment). These scenarios are unsupported by any available data and should be removed from Table 13. Also, there is a 30-day restriction on lifting sod after atrazine applications on Syngenta labels.

- EPA has agreed with information that shows that harvesting of Christmas trees occurs 3 to 9 months after a potential atrazine application and thus this exposure scenario need not be assessed. However, there is still a risk assessment calculation for workers staking, topping, training or harvesting Christmas trees (Table 12 of EPA's Occupational and Residential Exposure Assessment). In discussions with Christmas tree growers, grower associations and extension specialists, Syngenta has confirmed that Christmas trees are not staked. Shaping or shearing does not occur within 30 days of a potential atrazine application. The risk assessment should be revised to reflect the fact that these reentry activities do not occur during production and reference to any risk calculation should be removed from Table 12.

D. Residential Re-Entry: Ingestion

- Sticky hand-to-mouth: This scenario has not been adequately peer reviewed and should not be included in any assessment until properly evaluated and data availability and needs are understood. There are no data to presume that residues from a corn dislodgeable foliar residue study represent transfer of pesticide residues from turf to a child's moist hand. Nonetheless, in the interest of presenting a calculation of this type of scenario, the default 5% transfer rate should be replaced by the actual turf dislodgeable residue data for atrazine. As seen in the Clothier

(2000) study, a 3-fold increase in wet- versus dry-hand transfer should be used until more relevant data are developed for this scenario in turf. (See Appendix 1 of Attachment 5 for details.)

- Granular impregnated fertilizer ingestion: Based on the growth habits and leaf morphology of the warm-season turf grasses on the atrazine label, and the small granule size of impregnated fertilizer, this scenario is highly unlikely and should be removed from a screening-level, regulatory-based risk assessment. (See Appendix 2 of Attachment 5 for details.)

- Human Incidents: Syngenta is providing comments on human atrazine incident reports (Attachment 8).

E. Residue Chemistry and Tolerance Reassessment

- Hydroxy atrazine tolerances: Only hydroxy atrazine (G-34048) and desethylhydroxy atrazine (GS-17794) should be included in the tolerance expression for hydroxy triazines because the other hydroxy triazines are very minor components in the crop metabolic profiles. Syngenta has provided in Appendix 2 of Attachment 3 a justification for accepting the GS-17794 levels detected in crops as a marker residue for the total hydroxy triazine residue subset.

- Milk tolerance: According to all available data, the milk tolerance should remain at 0.02 ppm. Syngenta is providing with this response residue summary reports that support an amended tolerance on sweet corn forage of 1.5 ppm. The EPA risk assessment should be revised to reflect these additional data. By substituting the 1.5 ppm tolerance for the 4.0 ppm forage tolerance in the EPA dairy cattle diet used to justify raising the milk tolerance, and, by using an extrapolation procedure to adjust residues of parent and chloro metabolites found in the three level dairy feeding study (described in Attachment 3), the current milk tolerance is adequate to cover any residues that might potentially occur.

- Syngenta is providing summaries of the most recent residue-field trial data on corn and sorghum. These data will be used to support lower tolerances in corn and sorghum (Attachment 7).

- Percent crop treated: Information has not yet been provided on data sources or the weighting procedure for estimating usage. Syngenta requests a copy of this information when available.

- Label changes: If EPA cites a label revision made in conjunction with an atrazine use, then the specific EPA Registrant Number should be provided.

F. Chronic Dietary Exposure Assessment

- Syngenta has performed a revised 2001 chronic dietary exposure assessment for atrazine (included in this submission as Attachment 11). A comparison of chloro-triazine exposures for the U.S. population, infants (<1 year old) and children (1-6 years old) demonstrates that chronic exposure ranges from 0.018-0.002 µg/kg-bw/day depending on the sensitivity analysis performed for the various corn and sorghum usage parameters. Both the Syngenta and the 2001 Agency assessments contain pre-, post- and split-application weighted calculations for corn and sorghum residues incorporating percent of each usage, as well as percent of crop treated (base acres) adjustments. Syngenta's dietary assessment includes further refinement of the exposure estimate by incorporating incremental usage information for corn and sorghum.

- The Agency's revised assessment used corn and sorghum field trial data generated from samples taken 60 days after pre-emergence application, 30 days after post-emergence application, and 30 days after the maximum split-rate application. Syngenta proposes that future labels be amended to reflect longer pre-harvest intervals (PHIs) for corn and sorghum forage. Comparisons between Syngenta's 2001 dietary exposure estimate and the Agency's 2001 revised estimate should be made with the exposure evaluation using corn and sorghum residues generated from the newly proposed minimum pre-harvest intervals.

- Since both Syngenta and Agency exposure estimates utilized residue refinements associated with various corn and sorghum application regimes, the major difference between the exposure values was due to the length of the PHI and associated impact on the magnitude of corn and sorghum forage residues. A further reduction in exposure was observed after use of the incremental corn and sorghum usage information.

- In order to account for the simultaneous consumption of atrazine- and simazine-treated commodities, the Syngenta 2001 dietary assessment contained sensitivity analyses conducted by incorporating the metabolites of simazine that are common to atrazine for all simazine-treated commodities. Even with the addition of the simazine-treated crops and associated residue levels of the common metabolites of simazine, exposures for all populations were negligible (Attachment 11).

G. Mammalian Toxicology

- **Toxicity Endpoint Selection:**

  The chronic LH toxicological endpoint for atrazine should be determined using a benchmark dose approach (NOEL, LED_{10}) derived from all of the appropriate data, including the Fischer-344 LH study (Appendix D of Attachment 1).

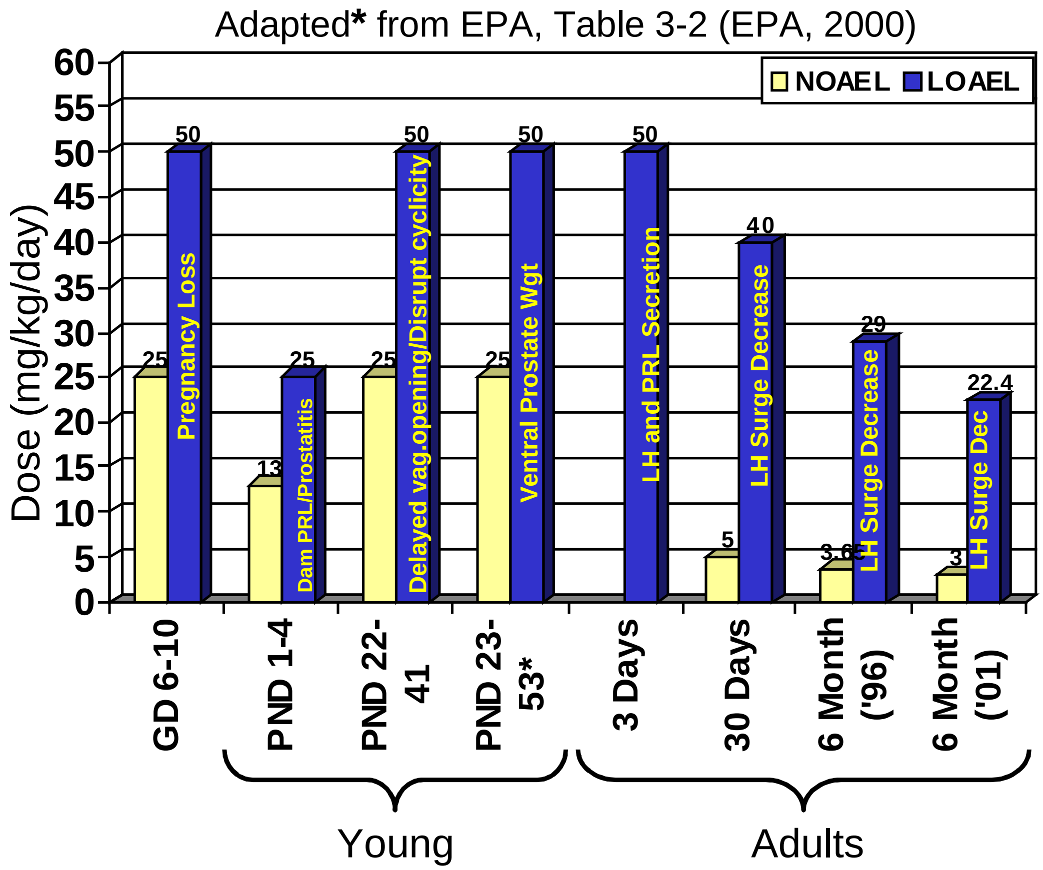
  In the Preliminary Human Health Risk Assessment for Atrazine (USEPA, 2001), EPA chose longer-term studies to define toxicity endpoints and NOELs for potential intermediate exposures to humans. In the preliminary assessment, the NOEL from a 6-month chronic rodent study, conducted in sexually mature female Sprague-Dawley rats, was used to represent the intermediate-term exposure of infants, children, young adults, and adults.

Instead, EPA should base the intermediate exposure toxicity endpoint on 7-day to 1-month studies. Shorter term studies better represent intermediate exposure in humans. Intermediate exposure for humans is defined by EPA as 30 days to several months. Since a human lifetime is defined by EPA as 70 years and the lifetime of a rat is approximately 2.5 years, developmental stages, such as pre-puberty, puberty and adolescence are much shorter periods of time in the rat. Thus, many toxicologists would consider the ratio of human to the rat aging to be 35 to 1 (70 years human:2 years rat). However, a conservative comparison to the basal metabolic rates would suggest that the rat has a 3- to 4-fold higher development rate than man (Rodricks *et al*., 2001). Hence, the ratio for comparison of rats to man should consider factors between 3 to 1 and 35 to 1, instead of 1 to 1.

Therefore, given the several-fold aging factor, a 7-day to 1-month rat study would be appropriate for potential human exposure over "intermediate" durations of 30 days to several months. A 6-month study in rats would represent several years of exposure in humans, which is defined more appropriately as a chronic exposure. Syngenta recommends this preliminary determination be reconsidered because there are more appropriate shorter duration studies. Furthermore, these studies target selected age brackets that better represent these population subgroups (See Table 3 at the end of this Section) for Toxicity Endpoints).

This is illustrated in Table 3-2 (p. 72) of EPA's Preliminary Draft Hazard and Dose-Response Assessment-atrazine (USEPA, 2000) where the EPA summarized the relationship between dose and duration of treatment for various endocrine-related parameters in female Sprague-Dawley rats exposed to atrazine (Figure 1).

Figure 1



*EPA Ventral prostate weight data has replaced EPA's preputial separation data.

The data presented in this table leads to the following two important conclusions.

1) Changes in LH provide the most sensitive indicator of the effect of atrazine on the endocrine system in the female SD rat.

2) When female Sprague-Dawley rats are exposed to atrazine at a younger age and/or for a shorter duration of time, the no observed adverse effect level (NOAEL) increases. This is further illustrated in Table 1, which summarizes the results from two one-month and two 6-month studies.

EPA's Response to Syngenta's Comments made on the draft preliminary risk assessment (USEPA, 2001) states that the endpoint selected (1.8 mg/kg/day NOEL) for potential intermediate-term exposures is reasonable to use because data from a 1-month study showed effects on LH surge at 2.5 mg/kg/day after one month of dosing [from non-repeat bleed measures]. However, studies using non-repeat bleed measures are not preferred since they involve sacrifice of a number of rats for a selected time point in the LH surge for subsequent calculation of the mean measured LH levels for one data point. To create the next data point in a non-repeat bleed study another set of rats would be sacrificed and once again the calculation of the mean measured LH levels would comprise the second data point. This step would be repeated until enough data points were available to build a curve to characterize LH surge. This approach does not afford any opportunity for consideration of any inherent within-animal variability and the subsequent production of meaningful data (see Appendix A of Attachment 1).

Contrary to non-repeat bleed studies, studies conducted with the repeat measure technique, i.e., monitoring the serum LH levels by sampling from an individual, ovariectomized, and estrogen-primed female rat during the LH surge is superior to pooling serum LH values at a specific time point.

Although studies using repeat bleed measures are scientifically preferred, there is still a need to correct for the within-animal variation for the time occurrence of the surge. Since the LH surge occurs uniquely in each female rat, it is essential, both from statistical, as well as biological standpoints, that each subject is monitored repeatedly so that she can serve as her own control. This is particularly true for typical sample sizes for this type of study, i.e., 10 to 15 animals/group.

Based on additional statistical data analyses and application of the procedure of Cooper et al., 1999 for rescaling the time axis to individual animal peak height for LH surge (See Appendix B), the actual NOEL in the 1-month study, employing individual animal bleeding, was 40 mg/kg/day. The LOAEL in this study was 200 mg/kg/day (the highest dose). Additionally, in a study to be finalized in May 2001 (Minnema, 2001a) the LOAEL was 200 mg/kg/day and the NOEL was 40 mg/kg/day (See Attachment 1, Appendices B and E).

Table 1. Effects of Atrazine on LH Surge (repeat measures)[1,2] in Ovariectomized Estrogen-primed Female Sprague-Dawley Rats

Duration of Treatment	mg/kg/day		Reference
	NOEL	LOAEL	
1 Month	40	200 (HDT)	Morseth, 1996a
	40	200 (HDT)	Minnema, 2001a
6 Months	3.65	29 (HDT)	Morseth, 1996b
	≥ 3.0	22.4 (HDT)	Minnema, 2001b; Minnema et al., 2001

[1]Non-repeat bleed sampling (i.e., individual animals/data-point) was found to be a statistically and biologically unacceptable approach to measure the impact of treatment on the LH surge (See Attachment 1, Appendix A).
[2]Applying the procedure of Cooper et al. (1999) for re-scaling the time axis to individual animal peak height for the LH surge (See Attachment 1, Appendix B)

Studies on the effect of diamino-chloro-triazine (DACT) confirm these findings as seen in Table 2.

Table 2. Effects of DACT on Peak LH Surge (repeat measures)[1] in Ovariectomized Estrogen-primed Female Sprague-Dawley Rats

Duration of Treatment	mg/kg/day		Reference
	NOEL	LOAEL	
1 Month	40[2]	200 (HDT)	Minnema, 2001a
6 Months	$\geq$ 3.2	16.7	Minnema, 2001b, Minnema et al., 2001

[1] Applying the procedure of Cooper et al., 1999 for re-scaling the time axis to individual animal peak height for the LH surge (See Attachment 1, Appendix B)
[2] Significantly different when the peak triad data using pooled-variance t-comparison at 40 mg/kg/day is compared to the control peak triad data (P=0.032)

In addition, several studies were conducted by EPA to evaluate the effect of atrazine on reproductive and/or developmental parameters. These effects, which are postulated to be mediated through an effect on LH are summarized in Part A, Chapter 1 of EPA's Preliminary Draft Hazard and Dose-Response Assessment and Characterization – Atrazine (USEPA, 2000). The NOAELs in these short duration studies are greater than those reported in the longer-term studies on LH.

- **Selection of a Representative Species in a Probablistic Evaluation**

In conducting a deterministic evaluation of pesticide exposure and risk, EPA has traditionally selected an upper bound (i.e. conservative) estimate of exposure and has used the most sensitive toxicological endpoint found in the most sensitive species evaluated.

This approach is not appropriate when a higher tier probabilistic assessment of exposure and risk is being conducted. Under these conditions, it is important to factor in the probability that exposure may also be low as well as high. Furthermore, in the absence of conclusive dose scaling data for each species, there is an equal probability that the human is similar to the least sensitive species as there is that the human is similar to the most sensitive species evaluated. In the case of atrazine, the toxicological mode-of-action data confirm that the Sprague-Dawley rat is not relevant to humans and the Fischer-344 rat is a more appropriate model.

- **EPA's use of the FQPA Safety Factor for children:**

EPA's preliminary decision to retain the FQPA 10X safety factor is not supported by the data for all age groups and exposure durations as discussed below and is an error. EPA cites as the basis for another 10X SF two potential areas of concern:

(a) Concerns around studies that have shown a neuroendocrine mode-of-action at high doses in the S-D rat and related strains not considered relevant to humans; and
(b) results from one developmental toxicity study (out of 4 conducted in rats and rabbits) with diaminochloro-triazine (DACT), which the Agency has interpreted as potential evidence that infants are more sensitive than adults even though this interpretation is not scientifically defensible.

Use of the additional 10X safety factor for atrazine is not scientifically warranted based on the currently available data.

The Food Quality Protection Act requires that an additional tenfold margin of safety be applied for infants and children to take into account potential pre- and postnatal toxicity and completeness of the data with respect to exposure and toxicity to infants and children. On the basis of reliable data, the USEPA Administrator could use a different margin of safety if that margin were considered safe for infants and children (Kimmel, 2001). The FQPA Safety Factor is designed to account for, among other things, the "completeness of data with respect to….toxicity to infants and children" (USEPA, 1999). HED's application of the 10X safety factor for atrazine greatly exceeds FQPA specifications. The available toxicology database for atrazine is sufficient to demonstrate with reasonable certainty that no harm will result to infants and young children from aggregate exposure to atrazine.

In determining the "reasonable certainty of no harm" finding, HED is required by FQPA statute to ascertain three specific aspects of the available toxicology and exposure data:

A. The completeness and reliability of the toxicology database,
B. The potential for pre- and postnatal effects, and
C. The completeness and reliability of the exposure database.

The following review of each of these three requirements indicates that the available toxicology and exposure databases warrant reduction of the FQPA safety factor to 1X for atrazine on the basis of comparable conclusions reached by HED with regard to the hydroxyatrazine metabolite. HED's assessment of the available scientific data supports a finding of completeness and reliability pertaining to the data requirements for criteria (A) and (C). With regard to criterion (B), HED's interpretation of the available toxicology mischaracterizes the differences in sensitivity between infants and adults. It is entirely justified under the FQPA statute to use a different safety factor from 10X if the agency determines, "on the basis of reliable data, such margin will be safe for infants and children." An additional FQPA Safety Factor is not warranted for atrazine.

A. Completeness and reliability of the toxicology database

The first aspect requiring HED consideration is the evaluation of the completeness and reliability of the toxicology database. The Office of Pesticides Program's (OPP) default position is that a database uncertainty factor should be applied when one or more of the following types of studies is lacking in the "core toxicology database" for a particular pesticide:

- A two generation reproductive toxicity study;
- Two developmental toxicity studies (in different species); and,
- Two chronic toxicity studies (in the rodent and non-rodent).

According to OPP's 1998 interim policy statement to the FIFRA Scientific Advisory Panel describing its approach to implementation of the FQPA Safety Factor provision, OPP wrote that "reliable data support using the standard uncertainty factors (usually 100X for combined inter- and intraspecies variability) and not using the additional uncertainty factor when OPP has a complete database and when the severity of the potential effect in infants and children, or the potency or unusual toxic properties of a compound, do not raise concerns regarding the adequacy of the traditional uncertainty factors" (USEPA, 2001).

Furthermore, HED's revised "Toxicology Chapter of the Reregistration Eligibility Decision" dated January 18, 2001 clearly indicates that all of the testing requirements (CFR 158.340) for food use of atrazine have been met HED indicates that the toxicology databases for atrazine and for atrazine-metabolites are considered complete for acute toxicity, subchronic toxicity, chronic toxicity, prenatal developmental toxicity, mutagenicity, and metabolism. HED has recommended, but does not require, an additional multi-generation reproduction study using diaminochloro-triazine (DACT).

In summary, HED's conclusions that atrazine's "available toxicology data base is complete and of high quality," precludes the need for an FQPA 10X Safety Factor. Because the FQPA safety factor was designed to account for, among other things, the "completeness of data with respect to … toxicity to infants and children", the OPP regards the presence or absence of studies in the core toxicology database as key in considering the application of an additional database uncertainty factor. For food use pesticides, it only infrequently has been found necessary to apply additional factors to account for gaps or deficiencies of this nature (USEPA, 2001).

B. Potential for pre- and postnatal effects

The second aspect requiring HED consideration is the determination of whether there is sufficient evidence of pre- or post- natal effects from exposure to atrazine or its metabolites. HED's application of a 100X uncertainty factor to take into account the combined inter- and intraspecies variability from animal studies is consistent with USEPA risk assessment policy and is sufficient to address the theoretical exposures and risks associated with agricultural and residential uses of atrazine.

Syngenta supports HED's interpretation of the available toxicology data base wherein "guideline studies have, for the most part, not indicated developmental / reproductive toxicity. There was no evidence of increased sensitivity / susceptibility in two rat and one rabbit developmental toxicity studies using atrazine or in a rat developmental toxicity study using deisopropyl atrazine or a rat developmental toxicity study using deethyl atrazine (these compounds are metabolites of atrazine)….there was no evidence of increased sensitivity / susceptibility in a two-generation study with atrazine" (USEPA, 2001).

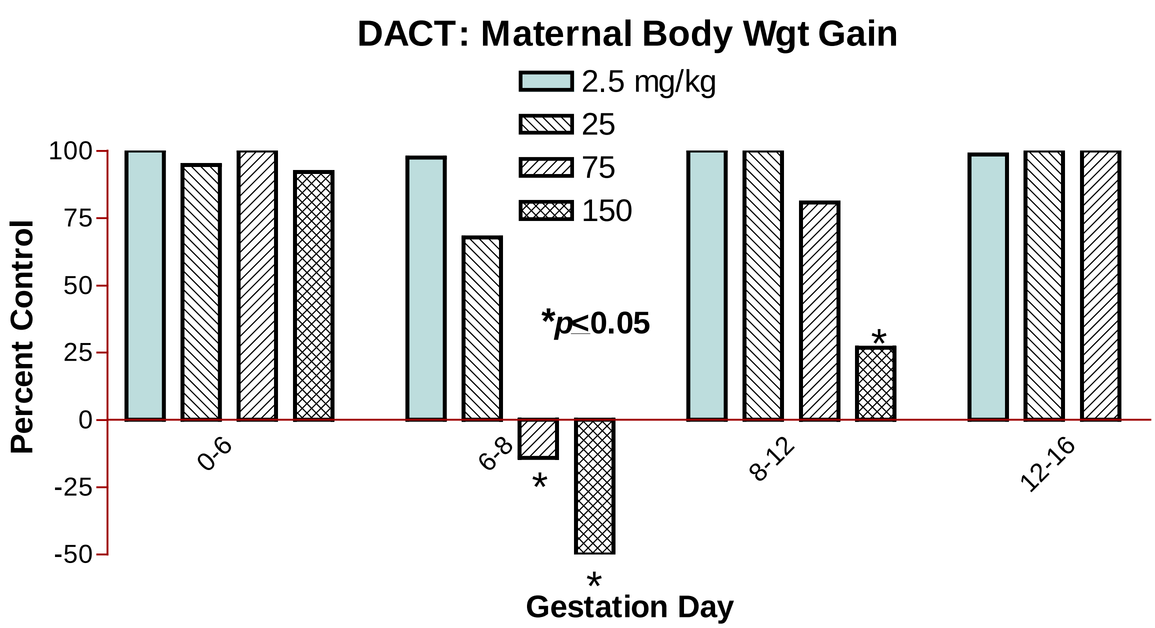
However, OPP's current practice to routinely apply an additional 10X FQPA Safety Factor when the data for a pesticide (USEPA, 1999) are evaluated either quantitatively or qualitatively to show increased sensitivity. Syngenta disagrees with EPA that there is scientific evidence to show that infants or children would be more susceptible to atrazine or DACT. The basis for EPA's contention is apparently twofold:

- that the DACT developmental study showed delayed ossification in pups at dose levels where the dams were not significantly affected and
- that delayed puberty in both sexes and prostate inflammation was reported following exposure of the maternal rat to atrazine, suggesting that these effects occur at dose levels lower than dose levels causing maternal toxicity.

DACT Developmental Study

Reasonable evidence exists in the DACT developmental study to show that dams were significantly affected at the same dose levels as pups. In this study, statistically significant skeletal variations occurred at 25, 75, and 150 mg/kg/day. Note in Figure 2 that maternal body weight gain from gestation days 6-8 was statistically affected at 75 and 150 mg/kg/day.

Figure 2



Although maternal body weight changes were not statistically significant for the 25 mg/kg/day group, the drop in body weight gain for these dams, as a group, was *32%.* A decrease of such magnitude is highly likely to delay skeletal development (Khera, 1981).

Further, one dam in the 25 mg/kg/day group began the study at a much heavier weight than the other dams. She weighed 290 grams at study start versus an average of 226 grams for the rest of the group. Applying Prochan's (1953) test for outlier data showed that this dam's body weight at the start of the study was statistically different from her dose level cohorts' weight. Then, in the first six days on test, before dosing, she *lost* 40 grams as opposed to an average weight *gain* by her cohorts of 42 grams. Her subsequent 31-gram body weight gain from gestation days 6 to 8 was much greater than the average for the rest of her group, which gained only 7 grams. Excluding this one dam from the 25 mg/kg/day group results in a 40% group mean reduction from the control group mean. Thus, dams were affected at 25 mg/kg/day (reduced body weight gain), showing that there is no greater sensitivity to the developing fetus than to the dam.

Pubertal Male and Female Studies; Infant and Children Sensitivity.

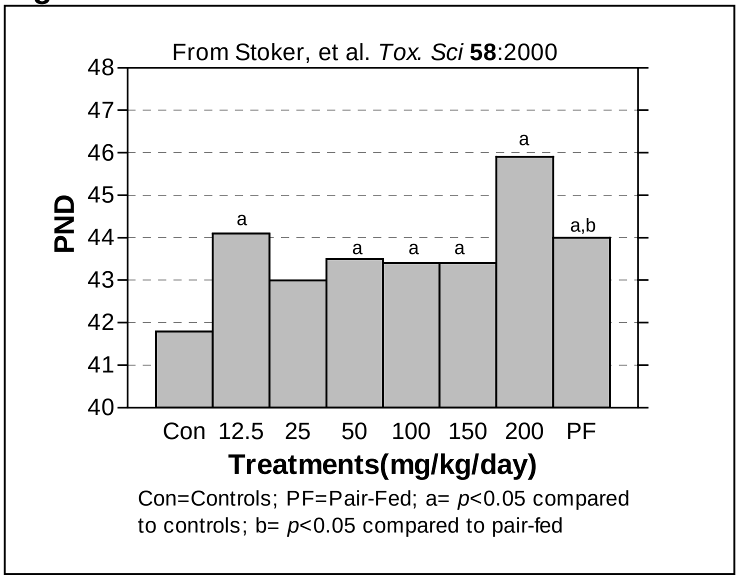
EPA's Response to Syngenta's Comments made on the draft preliminary risk assessment states that "The Registrant is also correct in noting that developmental toxicity studies conducted on atrazine at NHEERL are evidence that infants are more sensitive than adults." With this statement EPA implies that Syngenta agrees with the Agency's conclusion. **Syngenta does not agree scientifically with EPA on this point.** In fact, the lowest atrazine NOEL (1.8 mg/kg/day) is derived from a chronic study where atrazine was administered to adult female Sprague-Dawley rats for 6 months.

The EPA calculated NOELS for all developmental parameters evaluated (effects on *in utero* development [NOEL = 50 mg/kg/day] (Cummings, et al. 2000), effect on prolactin secretion during the early post-partum period [NOEL = 13 mg/kg/day] (Stoker, et al. 1999), effect on male preputial separation [NOEL = 6.3 mg/kg/day] (Stoker, et al 2000) and effect on vaginal opening [NOEL = 25 mg/kg/day] (Laws, et al. 2000) and all were observed at higher doses indicating that developing organisms are less sensitive than adults. An overview of some of the key NHEERL studies is provided below.

In the Stoker, *et al*. (2000) study, preputial separation was concluded to be one of the most sensitive indicators of atrazine's effect on post-partum development in the male Wistar rat. Control group preputial separation, statistical relevance, and a lack of dose-response are three parameters that require further analyses or research and lead to questions about the NOEL of 6.3 mg/kg/day.

For reference, Figure 4 from the Stoker, *et al.* (2000) paper is reproduced here (as Figure 3 below) because it illustrates several important points. One is an understanding of when preputial separation occurs. As stated in the "Methods" section of this paper, preputial separation in rats "…normally occurs between 40 and 50 days-of-age, with an average of 43 days…." This shows that the control group's preputial separation was earlier than usual.

Figure 3



In addition, preputial separation was delayed in the control group that was pair-fed with the 200 mg/kg/day group. Whereas there may have been a slight delay due to reduction in food consumption and body weight, the day of preputial separation occurred within a typical range (~44 days). The 5% difference between control and pair-fed control in postnatal days to preputial separation is statistically different, suggesting that the control group's preputial separation is earlier than usual or that a decrease in weight appeared to result in the same effects as atrazine treatment at $\leq$ 150 mg/kg/day.

Since the control group (standard and pair-fed) time to preputial separation is between 42 and 44 days postnatal, the atrazine treatment groups, with the singular exception of the 200 mg/kg/day group, are within the typical range for preputial separation.

Finally, no obvious dose-response is seen in these data. Statistical significance from the control group that was not pair-fed was reported at all dose levels *except* 25 mg/kg/day, which was actually *earlier* than the 12.5 mg/kg/day treatment group. Furthermore, no dose-response relationship can be seen among the treated groups. One would assume that the 12-fold difference in dose level between the 12.5 and 150 mg/kg/day groups would have produced a *longer* delay in preputial separation, but there is actually a slight decrease.

Although there are statistical differences in time to preputial separation when compared to the standard control group, the differences are neither consistent (no statistical significance at 25 mg/kg/day), nor do they show a dose-response. This study shows that there is a delay in preputial separation in male Wistar rats dosed at 200 mg/kg/day, with a NOAEL of 150 mg/kg/day, not 6.25 mg/kg/day. Overall, this study shows a LOAEL of 50 mg/kg/day, based on reduction in ventral prostate weight, and a NOAEL of 25 mg/kg/day. (See Attachment 1)

Stoker, *et al.* (1999) showed an apparent NOAEL for atrazine's suppression of suckling-induced prolactin release in dams and for prostatitis that reportedly developed in pups nursed by these dams. The dams were dosed twice a day, seven hours apart (at 0900 and 1600 hours) at doses of 0, 6.25, 12.5, or 50 mg/kg on postnatal days 1-4. As a consequence, dams received *nominal* daily doses of 2X each single dose, i.e. 0, 13, 25, 50 or 100 mg/kg/day. But the actual biological availability of atrazine and atrazine metabolites probably does not perfectly fit a 2X scheme. Given the half-life of atrazine, the likely body burden (area under the curve) of two doses spaced seven hours apart would be proportionally greater than 2X. Therefore, strict comparisons of dose levels used in this study versus other, single daily dose studies would be inappropriate.

The conclusion in the 1999 Stoker *et al.* study is that suckling-induced prolactin release in dams occurred at a dose level of "25" mg/kg/day (12.5 X2), with a NOAEL of "13" mg/kg/day (6.25 X2). Prostatitis was noted in the 120 day-old pups from dams treated with "25", "50" or "100" mg/kg/day, with a NOAEL of "13" mg/kg/day. The co-occurrence of effects in dams and offspring at the same dose level indicates that there is no greater sensitivity to atrazine by the developing offspring. (See Attachment 1).

<u>Connecting the DACT developmental study with the NHEERL studies</u>

EPA bases the conclusion of a developmental NOAEL (2.5 mg/kg/day) for DACT in part on the data generated by NHEERL. The Agency states: "this conclusion was reached…..in light of the findings with respect to delayed puberty in both sexes and prostate inflammation following exposure of the maternal rat to atrazine and the fact that the available data indicate that DACT exposure produces similar effects to those observed with atrazine" (USEPA, 2001). The NOELs from the pubertal and *in utero*/lactation studies are all higher than 2.5 mg/kg/day. The NOELS for all developmental parameters evaluated (effects on *in utero* development [NOEL = 50 mg/kg/day] (Cummings, et al. 2001), effect on prolactin secretion during the early post-partum period [NOEL = 13 mg/kg/day] (Stoker, et al. 1999), effect on male preputial separation [NOEL > 6.3 mg/kg/day] (Stoker, et al. 2000) and effect on vaginal opening [NOEL = 25 mg/kg/day] (Laws, et al. 2000) <u>all were observed at higher doses indicating that developing organisms are less sensitive than adults.</u>

<u>Additional safety factors / CNS Function:</u>

An extra safety factor for children potentially exposed to chemicals that affect the function of the rodent CNS is triggered when there is evidence that infants and children may be more sensitive than adults. As discussed above, all the evidence indicates that, in fact, developing organisms are less sensitive than are adults to atrazine.

Several experts have shown that there is increasing experimental evidence in toxicology studies of pesticides and other chemicals that young animals are not always more sensitive than older animals to chemically induced carcinogenesis and other non-cancer health effects (Charnley, et al. 2001; Calabrese, 2001; National Research Council, 1993; Putzrathg, 2001). The proceeding of a National Expert Workshop on evaluation of default safety factors in health risk assessment clearly cautioned against the application of 10X safety factors when significant toxicological data are known and the outcome of scientifically-defensible studies in adult and young animals can be discerned (Rahman, 2001).

PBPK Studies:

Syngenta is developing a physiologically based pharmacokinetic model (PBPK) to characterize and scale tissue dose in rodent studies to tissue dose in primates. The model will then be adjusted for developing organisms, and the magnitude of the scale factors will be determined. Using this method will allow the determination of the safety factor needed when extrapolating from rodent to man.

c. The completeness and reliability of the exposure database.

The third aspect requiring HED consideration is the completeness and reliability of the exposure data base.

EPA states that some uncertainty in the water monitoring data for the estimation of degradates in surface water and, to a greater extent, in ground water warrants the use of the additional 10X safety factor (USEPA, 2001). Syngenta has conducted an extensive characterization of the concentration of atrazine and its metabolite concentrations in groundwater CWS (See Attachment 10). Furthermore, Syngenta has developed and submitted regression equations to predict total chloro-triazine concentrations in surface water based on monitoring data for atrazine and its chloro-triazine degradates (See Attachment 4). These data show that total chloro-triazine concentrations in surface water are no greater than a factor of two times the corresponding atrazine concentrations.

In the EPA's Section 4 "Exposure Assessment" HED states that specific routes, pathways or durations of exposure are sufficiently understood to evaluate exposures to different subpopulations, which would include infants and young children (USEPA, 2001). EPA also states that "There are more monitoring data for atrazine, per se, from studies designed to assess ambient water quality, available for assessing the exposure to atrazine in ground and surface water than for any other pesticide" (USEPA, 2001).

Syngenta is submitting with this response a probabilistic assessment that characterizes the extent to which deterministic methodology overestimates theoretical risk from the aggregation of exposure to total chloro-triazines in diet and water. New information provided with this submission reduces uncertainty in the characterization of total chloro-triazine residues in water.

Table 3
Toxicity Endpoints for Atrazine

Subpopulation/ Age	Toxicity Study NOEL (mg/kg/day)
Acute Exposure (1 Day)	
Females (13 - 50 Years)	10 mg/kg/day
Short Term Exposure (1-7 Days)	
Infants < 1 Year	13[a]
Children (1-6 Years)	6.3 [b] & 50[c]
Children (7-12 Years)	6.3 [b] & 50[c]
Female (13-50 Years)	40[d]
Male (13-19 Years)	40[d]
Male (20+)Years	40[d]
All	40[d]
Intermediate Term Exposure (7 Days – Several Months)	
Infants < 1 Year	13[a]
Children (1-6 Years)	6.3 [b] & 50[c]
Children (7-12 Years)	6.3 [b] & 50[c]
Male or females (13-50 Years)	40[d]
All	40[d]
Long Term Exposure 3 Months – Lifetime	
All Subgroups	3.65[e]
All Subgroups	40[f,g]

[a] Developmental NOEL = 13 mg/kg/day (Male Wistar Rat) Effect on prolactin/prostatitis (Stoker et. al., 1999).
[b] Developmental NOEL = 6.3 mg/kg/day (Male Wistar Rat) Effect on preputial separation (Stoker et. al., 2000) ;
[c] Developmental NOEL = 50 mg/kg/day (Male SD Rat) Effect on preputial separation (Trentacosta et.al. In press);
[d] See Attachment 1, Appendix B and E.
[e] See Attachment 1, Appendix B.
[f] Chronic NOEL = 40 mg/kg/day; (Female Fischer 344 Rat) Estrous cycle disruption (Thakur A.K, 1991)
[g] Chronic NOEL = 40 mg/kg/day (Fischer-344 rats) LH surge suppression (Minnema et al., 2001, See Appendix C).

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H. Deterministic vs. Probabilistic Risk Assessment for Drinking Water

EPA has acknowledged that the deterministic risk assessment on total chloro-triazine exposure via diet and water would likely be conservative, and that the Agency will conduct a more realistic drinking water risk assessment using probabilistic techniques. Syngenta has conducted a probabilistic risk assessment on the aggregate dietary (deterministic estimates from EPA's draft RED) and drinking water concentrations of total chloro-triazines (calculated using EPA regression equations) in surface water for 28 community water systems (Table 4) that reported the highest exposure values. The assessment was conducted on the combined monitoring data from Syngenta (PLEX and the Voluntary Monitoring Program) and the Acetochlor Registration Partnership (ARP).

Distributions of total chloro-triazine daily doses (Acute), monthly average daily doses (Short-Term), quarterly average daily doses (Intermediate-Term / two scenarios), and lifetime average daily doses (Chronic) were determined and expressed as a percentage of the acute, short-term, intermediate-term and chronic RfD for atrazine.

The results are summarized in Table 5 and the estimated daily doses and their respective percentiles are presented in Appendices 1-5 and 6-10, respectively. The full report of the probabilistic analysis is included with these comments as Attachment 12.

The results indicate that none of the 28 community water systems exceeded the Drinking Water Level of Comparison for the Acute, short-term (Monthly Average), intermediate term (Quarterly Average), long term (Annual Average) or life time (Average calculated over a lifetime) at the 99.9^{th} percentile of exposure. Please note that although the extra 10X uncertainty factor was employed to calculate the RfD's used in the drinking water assessment, Syngenta does not believe that application of the factor for atrazine is scientifically valid.

Table 4
Location of 28 Selected Community Water Systems (CWSs)

CWS Index	Location				
	CWS #	CWS Name	City	County	State
1.	IA5903011	Chariton Municipal Water Works	Chariton	Lucas	IA
2.	IL0050300	Sorento Water Treatment Plant	Sorento	Bond	IL
3.	IL0250100	Flora Water Treatment Plant	Flora	Clay	IL
4.	IL0470200	W. Salem Water Treatment Plant	West Salem	Edwards	IL
5.	IL0510150	Farnia Water Treatment Plant	Farnia	Fayette	IL
6.	IL0610400	White Hall Water Treatment Plant	White Hall	Greene	IL
7.	IL1170150	Carlinville Water Works	Carlinville	Macoupin	IL
8.	IL1170400	Gillespie Water Treatment Plant	Gillespie	Macoupin	IL
9.	IL1170500	Hettick Water Supply	Hettick	Macoupin	IL
10.	IL1170950	Shipman Water Treatment Plant	Shipman	Macoupin	IL
11.	IL1175150	Palmyra-Modesto Water Commission	N Palmyra Twp	Macoupin	IL
12.	IL1175200	ADGPTV Water Commission	North Otter Twp	Macoupin	IL
13.	IL1210300	Kinmundy Water Treatment Plant	Kinmundy	Marion	IL
14.	IL1210450	Salem Water Treatment Plant	Salem	Marion	IL
15.	IL1214220	Centralia Water Treatment Plant	Centralia	Marion	IL
16.	IL1350300	Hillsboro Water Treatment Plant	Hillsboro	Montgomery	IL
17.	IL1910450	Wayne City Water Plant	Wayne City	Wayne	IL
18.	IL0250250	Louisville Water Treatment Plant	Louisville	Clay	IL
19.	IN5219006	Holland Water Department	Holland	Dubois	IL
20.	IN5240008	North Vernon Water Department	North Vernon	Jennings	IN
21.	IN5269001	Batesville Water Utility	Batesville	Ripley	IN
22.	IN5272001	Scottsburg Water Treatment Plant	Scottsburg	Scott	IN
23.	LA1047002	Iberville Water District #3	White Castle	Iberville	LA
24.	MO1010363	Higginsville Water Treatment Plant	Higginsville	Lafayette	MO
25.	MO2010112	Bucklin Water Department	Bucklin	Linn	MO
26.	M02010812	Vandalia Water Treatment Plant	Vandalia	Audrain	MO
27.	OH0801511	Sardinia Water Treatment Plant	Sardinia	Brown	OH
28.	OH4502314	Newark Water Works	Newark	Licking	OH

Table 5

Number of Community Water Systems with Distributions of Average Daily Total Chloro-Triazine Doses that Exceeded the DWLOC at the 100th and the 99.9th Percentile

Appendix Number	Basis for Reference Dose	Number of Estimated Dose Distributions with Less Than 99.9% Below the RfD among the 28 CWSs				
		Infants	**Children 1 to 6**	**Children 7 to 12**	**Adults 13 to 50**	**All**
7	Acute	Not Applicable	Not Applicable	Not Applicable	0	Not Applicable
8	Short Term	0	0	0	0	0
9	Intermediate Term	0	0	0	0	0
10	Intermediate Term	0	0	0	0	0
11	Chronic	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0
		Number of 28 CWSs Exceeding the DWLOC at the 100th Percentile				
		Infants	**Children 1 to 6**	**Children 7 to 12**	**Adults 13 to 50**	**All**
7	Acute	Not Applicable	Not Applicable	Not Applicable	0	Not Applicable
8	Short Term	1	1	1	0	4
9	Intermediate Term	0	0	0	0	2
10	Intermediate Term	0	0	0	0	2
11	Chronic	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0

Appendix 1
Estimated Total Chloro-Triazine Daily Doses (Acute) at the 99.9th Percentile

CWS Index	Acute Daily Dose (mg/kg/day) at the 99.9th Percentile for Females Ages 13 – 50
1.	6.40E-04
2.	5.20E-04
3.	8.80E-04
4.	7.50E-04
5.	9.10E-04
6.	8.30E-04
7.	9.40E-04
8.	1.90E-03
9.	2.00E-03
10.	1.80E-03
11.	1.10E-03
12.	9.60E-04
13.	7.50E-04
14.	3.00E-03
15.	1.20E-03
16.	1.10E-03
17.	1.40E-03
18.	1.00E-03
19.	8.70E-04
20.	1.10E-03
21.	8.00E-04
22.	8.90E-04
23.	1.40E-03
24.	1.00E-03
25.	7.30E-04
26.	1.20E-03
27.	2.20E-03
28.	9.20E-04

Appendix 2
Estimated Monthly Average (Short-Term)
Daily Total Chloro-Triazine Doses at the 99.9th Percentile

CWS Index	Monthly Average Daily Dose (mg/kg/day) at the 99.9th Percentile				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	All
1.	2.40E-03	1.00E-03	8.60E-04	5.70E-04	6.90E-04
2.	2.20E-03	9.00E-04	8.20E-04	5.20E-04	6.80E-04
3.	3.20E-03	1.20E-03	1.10E-03	6.90E-04	1.10E-03
4.	3.30E-03	1.20E-03	1.00E-03	7.70E-04	1.10E-03
5.	3.10E-03	1.30E-03	1.20E-03	7.80E-04	1.00E-03
6.	3.50E-03	1.50E-03	1.20E-03	8.00E-04	1.30E-03
7.	2.80E-03	1.20E-03	1.10E-03	6.60E-04	9.70E-04
8.	8.20E-03	3.00E-03	2.40E-03	1.70E-03	2.20E-03
9.	7.20E-03	2.50E-03	2.40E-03	1.80E-03	2.50E-03
10.	7.10E-03	2.90E-03	2.70E-03	1.80E-03	2.40E-03
11.	4.30E-03	1.80E-03	1.50E-03	1.10E-03	1.40E-03
12.	3.50E-03	1.30E-03	1.00E-03	7.60E-04	1.10E-03
13.	2.70E-03	1.00E-03	9.00E-04	7.20E-04	9.20E-04
14.	1.20E-02	4.50E-03	4.20E-03	2.70E-03	3.40E-03
15.	4.80E-03	2.10E-03	1.80E-03	1.10E-03	1.60E-03
16.	5.60E-03	1.60E-03	1.50E-03	1.10E-03	1.40E-03
17.	4.20E-03	1.60E-03	1.10E-03	1.10E-03	1.10E-03
18.	3.90E-03	1.70E-03	1.60E-03	9.10E-04	1.30E-03
19.	3.70E-03	1.60E-03	1.30E-03	8.30E-04	1.10E-03
20.	3.70E-03	1.60E-03	1.30E-03	8.10E-04	1.00E-03
21.	3.20E-03	1.30E-03	1.10E-03	7.70E-04	9.00E-04
22.	4.00E-03	1.60E-03	1.40E-03	8.70E-04	1.50E-03
23.	4.20E-03	1.80E-03	1.40E-03	9.80E-04	1.40E-03
24.	4.30E-03	1.80E-03	1.60E-03	1.00E-03	1.60E-03
25.	2.70E-03	1.10E-03	1.10E-03	7.30E-04	9.70E-04
26.	4.80E-03	1.70E-03	1.50E-03	1.00E-03	1.50E-03
27.	9.30E-03	3.80E-03	3.00E-03	2.10E-03	2.60E-03
28.	2.10E-03	7.40E-04	6.20E-04	4.40E-04	6.20E-04

Appendix 3
Estimated Quarterly Average (Intermediate-Term)
Daily Total Chloro-Triazine Doses at the 99.9th Percentile

CWS Index	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	All
1.	2.10E-03	8.20E-04	6.60E-04	4.60E-04	5.00E-04
2.	1.80E-03	8.20E-04	7.00E-04	4.40E-04	7.20E-04
3.	2.10E-03	8.80E-04	8.50E-04	5.40E-04	8.10E-04
4.	2.60E-03	1.20E-03	9.00E-04	6.20E-04	8.20E-04
5.	2.80E-03	1.00E-03	9.60E-04	6.80E-04	8.90E-04
6.	3.30E-03	1.50E-03	1.20E-03	7.70E-04	1.30E-03
7.	2.10E-03	9.20E-04	7.80E-04	5.10E-04	7.90E-04
8.	5.80E-03	2.10E-03	1.80E-03	1.40E-03	1.60E-03
9.	5.10E-03	2.10E-03	1.80E-03	1.20E-03	1.80E-03
10.	6.90E-03	2.90E-03	2.80E-03	1.50E-03	2.80E-03
11.	4.10E-03	1.70E-03	1.60E-03	9.70E-04	1.50E-03
12.	2.30E-03	9.60E-04	8.70E-04	5.40E-04	9.90E-04
13.	2.30E-03	9.40E-04	8.50E-04	5.30E-04	8.50E-04
14.	7.10E-03	2.80E-03	2.30E-03	1.70E-03	2.20E-03
15.	3.10E-03	1.40E-03	1.20E-03	7.50E-04	1.10E-03
16.	3.10E-03	1.10E-03	1.00E-03	7.70E-04	9.00E-04
17.	2.20E-03	9.20E-04	8.10E-04	5.20E-04	8.10E-04
18.	3.00E-03	1.30E-03	1.20E-03	7.10E-04	1.00E-03
19.	3.60E-03	1.50E-03	1.20E-03	8.30E-04	1.00E-03
20.	2.10E-03	8.70E-04	8.10E-04	5.30E-04	7.30E-04
21.	3.30E-03	1.20E-03	1.00E-03	7.80E-04	9.00E-04
22.	3.90E-03	1.60E-03	1.30E-03	8.70E-04	1.10E-03
23.	2.00E-03	8.80E-04	8.10E-04	4.90E-04	8.60E-04
24.	3.20E-03	1.30E-03	1.20E-03	7.80E-04	1.20E-03
25.	2.90E-03	1.20E-03	1.00E-03	7.30E-04	8.90E-04
26.	2.80E-03	1.20E-03	9.70E-04	6.40E-04	1.10E-03
27.	6.30E-03	2.60E-03	2.40E-03	1.40E-03	1.90E-03
28.	1.30E-03	5.80E-04	5.60E-04	3.30E-04	4.90E-04

Appendix 4
Estimated Quarterly Average (Intermediate-Term)
Daily Total Chloro-Triazine Doses at the 99.9th Percentile

CWS Index	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	All
1.	2.00E-03	8.60E-04	7.40E-04	5.00E-04	6.00E-04
2.	1.80E-03	7.90E-04	7.30E-04	4.40E-04	6.60E-04
3.	2.10E-03	8.90E-04	8.00E-04	5.50E-04	7.60E-04
4.	2.20E-03	9.70E-04	8.70E-04	5.20E-04	8.40E-04
5.	2.50E-03	9.60E-04	8.90E-04	6.00E-04	9.50E-04
6.	3.30E-03	1.40E-03	1.20E-03	7.60E-04	1.30E-03
7.	2.30E-03	1.00E-03	9.10E-04	5.60E-04	8.60E-04
8.	6.00E-03	2.50E-03	2.00E-03	1.40E-03	1.60E-03
9.	6.20E-03	2.30E-03	2.10E-03	1.50E-03	2.00E-03
10.	6.80E-03	2.90E-03	2.70E-03	1.80E-03	2.30E-03
11.	4.30E-03	1.80E-03	1.60E-03	9.60E-04	1.50E-03
12.	2.60E-03	1.10E-03	9.40E-04	6.50E-04	1.00E-03
13.	2.50E-03	9.30E-04	8.30E-04	6.00E-04	8.10E-04
14.	7.20E-03	3.10E-03	2.70E-03	1.70E-03	2.40E-03
15.	2.90E-03	1.30E-03	1.20E-03	7.00E-04	1.20E-03
16.	3.00E-03	1.30E-03	1.10E-03	7.20E-04	9.90E-04
17.	2.60E-03	9.70E-04	8.70E-04	6.20E-04	7.50E-04
18.	3.20E-03	1.30E-03	1.20E-03	7.50E-04	1.00E-03
19.	2.90E-03	1.30E-03	1.20E-03	7.40E-04	9.50E-04
20.	2.70E-03	1.00E-03	8.50E-04	6.80E-04	8.20E-04
21.	2.90E-03	1.20E-03	9.80E-04	7.40E-04	8.20E-04
22.	3.10E-03	1.30E-03	1.20E-03	7.30E-04	1.10E-03
23.	2.80E-03	1.20E-03	1.10E-03	6.30E-04	9.70E-04
24.	4.30E-03	1.60E-03	1.40E-03	9.40E-04	1.20E-03
25.	2.70E-03	1.10E-03	1.10E-03	5.80E-04	1.10E-03
26.	2.70E-03	1.10E-03	1.00E-03	6.90E-04	1.10E-03
27.	7.50E-03	3.00E-03	2.80E-03	1.80E-03	2.30E-03
28.	1.20E-03	5.10E-04	4.80E-04	3.20E-04	5.30E-04

Appendix 5
Estimated Lifetime Average (Chronic)
Daily Total Chloro-Triazine Doses at the 99.9th Percentile

CWS Index	Chronic Dose = Lifetime Average Daily Dose at the 99.9th Percentile for the General Population
1.	1.70E-04
2.	1.90E-04
3.	1.80E-04
4.	2.80E-04
5.	3.20E-04
6.	2.30E-04
7.	2.80E-04
8.	2.70E-04
9.	5.70E-04
10.	4.50E-04
11.	3.70E-04
12.	3.40E-04
13.	1.60E-04
14.	3.40E-04
15.	2.90E-04
16.	2.60E-04
17.	1.90E-04
18.	2.50E-04
19.	1.80E-04
20.	1.50E-04
21.	2.40E-04
22.	1.80E-04
23.	2.20E-04
24.	2.40E-04
25.	1.30E-04
26.	2.80E-04
27.	1.90E-04
28.	1.00E-04

Appendix 6
Percentage of the Estimated Distribution of
Daily (Acute) Doses Below the Acute RfD

CWS Index	Percentage Below Acute RfD for Females Age 13 – 50 Years
1.	100%
2.	100%
3.	100%
4.	100%
5.	100%
6.	100%
7.	100%
8.	100%
9.	100%
10.	100%
11.	100%
12.	100%
13.	100%
14.	100%
15.	100%
16.	100%
17.	100%
18.	100%
19.	100%
20.	100%
21.	100%
22.	100%
23.	100%
24.	100%
25.	100%
26.	100%
27.	100%
28.	100%

Appendix 7
Percentage of the Estimated Distribution of Monthly Average (Short-Term) Daily Total Chloro-Triazine Doses Below the Short-Term RfD

CWS Index	Percentage Below Short-Term RfD				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	All
1.	100%	100%	100%	100%	100%
2.	100%	100%	100%	100%	100%
3.	100%	100%	100%	100%	100%
4.	100%	100%	100%	100%	100%
5.	100%	100%	100%	100%	100%
6.	100%	100%	100%	100%	100%
7.	100%	100%	100%	100%	100%
8.	100%	100%	100%	100%	100%
9.	100%	100%	100%	100%	100%
10.	100%	100%	100%	100%	99.99%
11.	100%	100%	100%	100%	100%
12.	100%	100%	100%	100%	100%
13.	100%	100%	100%	100%	100%
14.	99.95%	99.98%	99.99%	100%	99.96%
15.	100%	100%	100%	100%	100%
16.	100%	100%	100%	100%	99.99%
17.	100%	100%	100%	100%	100%
18.	100%	100%	100%	100%	100%
19.	100%	100%	100%	100%	100%
20.	100%	100%	100%	100%	100%
21.	100%	100%	100%	100%	100%
22.	100%	100%	100%	100%	100%
23.	100%	100%	100%	100%	100%
24.	100%	100%	100%	100%	100%
25.	100%	100%	100%	100%	100%
26.	100%	100%	100%	100%	100%
27.	100%	100%	100%	100%	99.98%
28.	100%	100%	100%	100%	100%

Appendix 8
Percentage of the Estimated Distribution of Quarterly Average (Intermediate-Term) Daily Dose Below the Intermediate-Term RfD

CWS Index	Percentage Below Intermediate-Term RfD Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	All
1.	100%	100%	100%	100%	100%
2.	100%	100%	100%	100%	100%
3.	100%	100%	100%	100%	100%
4.	100%	100%	100%	100%	100%
5.	100%	100%	100%	100%	100%
6.	100%	100%	100%	100%	100%
7.	100%	100%	100%	100%	100%
8.	100%	100%	100%	100%	100%
9.	100%	100%	100%	100%	100%
10.	100%	100%	100%	100%	99.98%
11.	100%	100%	100%	100%	100%
12.	100%	100%	100%	100%	100%
13.	100%	100%	100%	100%	100%
14.	100%	100%	100%	100%	99.99%
15.	100%	100%	100%	100%	100%
16.	100%	100%	100%	100%	100%
17.	100%	100%	100%	100%	100%
18.	100%	100%	100%	100%	100%
19.	100%	100%	100%	100%	100%
20.	100%	100%	100%	100%	100%
21.	100%	100%	100%	100%	100%
22.	100%	100%	100%	100%	100%
23.	100%	100%	100%	100%	100%
24.	100%	100%	100%	100%	100%
25.	100%	100%	100%	100%	100%
26.	100%	100%	100%	100%	100%
27.	100%	100%	100%	100%	100%
28.	100%	100%	100%	100%	100%

Appendix 9
Percentage of the Estimated Distribution of Quarterly Average (Intermediate-Term) Daily Dose Below the Intermediate-Term RfD

PWS Index	Percentage Below Intermediate-Term RfD Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	All
1.	100%	100%	100%	100%	100%
2.	100%	100%	100%	100%	100%
3.	100%	100%	100%	100%	100%
4.	100%	100%	100%	100%	100%
5.	100%	100%	100%	100%	100%
6.	100%	100%	100%	100%	100%
7.	100%	100%	100%	100%	100%
8.	100%	100%	100%	100%	100%
9.	100%	100%	100%	100%	100%
10.	100%	100%	100%	100%	99.99%
11.	100%	100%	100%	100%	100%
12.	100%	100%	100%	100%	100%
13.	100%	100%	100%	100%	100%
14.	100%	100%	100%	100%	99.99%
15.	100%	100%	100%	100%	100%
16.	100%	100%	100%	100%	100%
17.	100%	100%	100%	100%	100%
18.	100%	100%	100%	100%	100%
19.	100%	100%	100%	100%	100%
20.	100%	100%	100%	100%	100%
21.	100%	100%	100%	100%	100%
22.	100%	100%	100%	100%	100%
23.	100%	100%	100%	100%	100%
24.	100%	100%	100%	100%	100%
25.	100%	100%	100%	100%	100%
26.	100%	100%	100%	100%	100%
27.	100%	100%	100%	100%	100%
28.	100%	100%	100%	100%	100%

Appendix 10
Percentage of the Estimated Distribution of Lifetime Average Daily Doses (Chronic) Below the Chronic RfD

CWS Index	Percentage Below Chronic RfD (0.0018 mg/kg-day)
1.	100%
2.	100%
3.	100%
4.	100%
5.	100%
6.	100%
7.	100%
8.	100%
9.	100%
10.	100%
11.	100%
12.	100%
13.	100%
14.	100%
15.	100%
16.	100%
17.	100%
18.	100%
19.	100%
20.	100%
21.	100%
22.	100%
23.	100%
24.	100%
25.	100%
26.	100%
27.	100%
28.	100%

Attachment 1

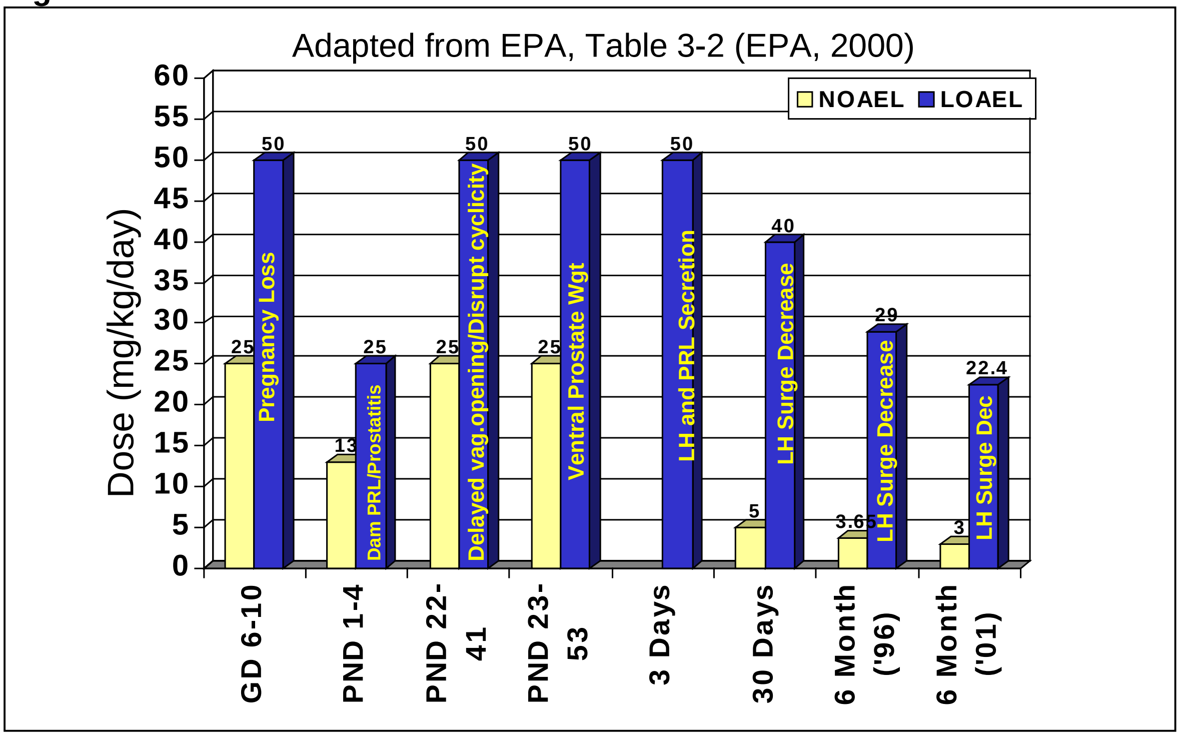
Syngenta's Comments on EPA Atrazine Preliminary Risk Assessment Toxicology Chapter January 19, 2001

Toxicity Endpoint Selection:

In the Preliminary Human Health Risk Assessment for Atrazine, EPA has incorrectly utilized no-observed adverse effect levels (NOAELs) defined in studies characterizing the effects of atrazine on the endocrine system of rodents. In EPA's assessment, the NOEL from a 6-month chronic rodent study conducted in sexually mature female Sprague-Dawley rats was used to represent the intermediate-term exposure of infants, children, young adults, and adults. More appropriate studies are available to define the reference dose (RfD) for potential intermediate exposure to humans.

This is illustrated in Table 3-2 (p. 72) of EPA's Preliminary Draft Hazard and Dose-Response Assessment-atrazine (USEPA, 2000) where the EPA summarized the relationship between dose and duration of treatment for various endocrine-related parameters in female Sprague-Dawley rats exposed to atrazine (Figure 1).

Figure 1



The data presented in this table lead to the following two important conclusions.

3) Changes in LH in the adult Sprague-Dawley rat provided the most sensitive indicator of the effect of atrazine on the rodent endocrine system.

4) When female Sprague-Dawley rats are exposed to atrazine at a younger age and/or for a shorter duration of time, the NOAELs increase. This is illustrated in Table 1, which summarizes the results from 2 one-month and two 6-month atrazine studies.

Table 1. Effects of Atrazine on LH Surge (repeat measures)[1,2] in Ovariectomized Estrogen-primed Female Sprague-Dawley Rats

Duration of Treatment	mg/kg/day		Reference
	NOEL	LOAEL	
1 Month	40	200 (HDT)	Morseth, (1996a)
	40	200 (HDT)	Minnema, (2001a)
6 Months	3.65	29 (HDT)	Morseth, (1996b)
	$\geq$ 3.0	22.4 (HDT)	Minnema et al., (2001); Minnema, (2001b)

[1] Non-repeat bleed sampling (i.e., individual animals/data-point) was found to be a statistically and biologically unacceptable approaches for measurement the impact of treatment on the LH surge (See Appendix A).
[2] Applying the procedure of Cooper et al., (1999) [2] for re-scaling the time axis to individual animal peak height for the LH surge (See Appendix B)

The actual NOAEL in the 1996 Morseth 1-month study was 40 mg/kg/day as opposed to EPA's conclusion of 2.5 mg/kg/day. This is based on the preferred data from repeated individual animal bleeding (instead of non-repeat bleeding) and on additional statistical data analyses. The additional analyses "standardized" individual animal LH surge peaks by application of the procedure of Cooper et al., (1999)[2]. This procedure rescales the time axis to individual animal peak height for the LH surge (see Table 1, above, and Attachment 1, Appendix B), allowing a more accurate assessment of atrazine's effect on LH surge peak height. The LOAEL in this study was 200 mg/kg/day (the highest dose).

Additionally, in a study to be finalized May, 2001 [Minnema, (2001a)] the LOAEL was 200 mg/kg/day and the NOEL was 40 mg/kg/day, based on analyses of the data as described previously (See Table 1, above, and Attachment 1, Appendices B and E).

Studies on the effect of diamino-chloro-triazine (DACT) confirm these findings as seen in Table 2.

Table 2. Effects DACT on LH Surge (repeat measures)[1,2] in Ovariectomized Estrogen-primed Female Sprague-Dawley Rats

Duration of Treatment	Compound	mg/kg/day		Reference
		NOEL	LOAEL	
1 Month	DACT	40[2]	200	Minnema, (2001a)
6 Months	DACT	$\geq$ 3.2	16.7	Minnema et al., (2001)

[1] Applying the procedure of Cooper et al., (1999) [2] for re-scaling the time axis to individual animal peak height for the LH surge (See Appendix B)
[2] 40 mg/kg/day was significant at $p<0.05$, but not significant at $p<0.001$, using the comparison of the peak triad versus control.

In addition, several studies were conducted by EPA to evaluate the effect of atrazine on reproductive and/or developmental parameters. These effects, which are postulated to be mediated through an effect on LH are summarized in Table 1-10 of EPA's Preliminary EPA's Preliminary Draft Hazard and Dose-Response Assessment-atrazine (USEPA, 2000). The NOAELs in these short duration studies are greater than those reported in the longer-term studies on LH.

Selection of a Representative Species in a Probabilistic Evaluation

In conducting a deterministic evaluation of pesticide exposure and risk, EPA has traditionally selected an upper bound (i.e. conservative) estimate of exposure and has used the most sensitive toxicological endpoint found in the most sensitive species evaluated.

Syngenta believes that this approach is not appropriate when a higher tier probabilistic assessment of exposure and risk is being conducted. Under these conditions, it is important to factor in the probability that exposure may also be low, as well as high. Furthermore, in the absence of conclusive dose scaling data for each species, there is an equal probability that the human is similar to the least sensitive species as there is that the human is similar to the most sensitive species evaluated. In the case of atrazine, the toxicological mode-of-action data confirm that the Sprague-Dawley rat is not relevant to humans and the Fischer-344 rat is a more appropriate model.

The Chronic LH toxicological endpoint for atrazine should be determined using a benchmark dose approach (NOEL, LED_{10}) derived from all three 6-month atrazine studies on LH, including the Fischer-344 LH study (Appendices B, C, and D of Attachment 1).

EPA's use of the FQPA Safety Factor for Children

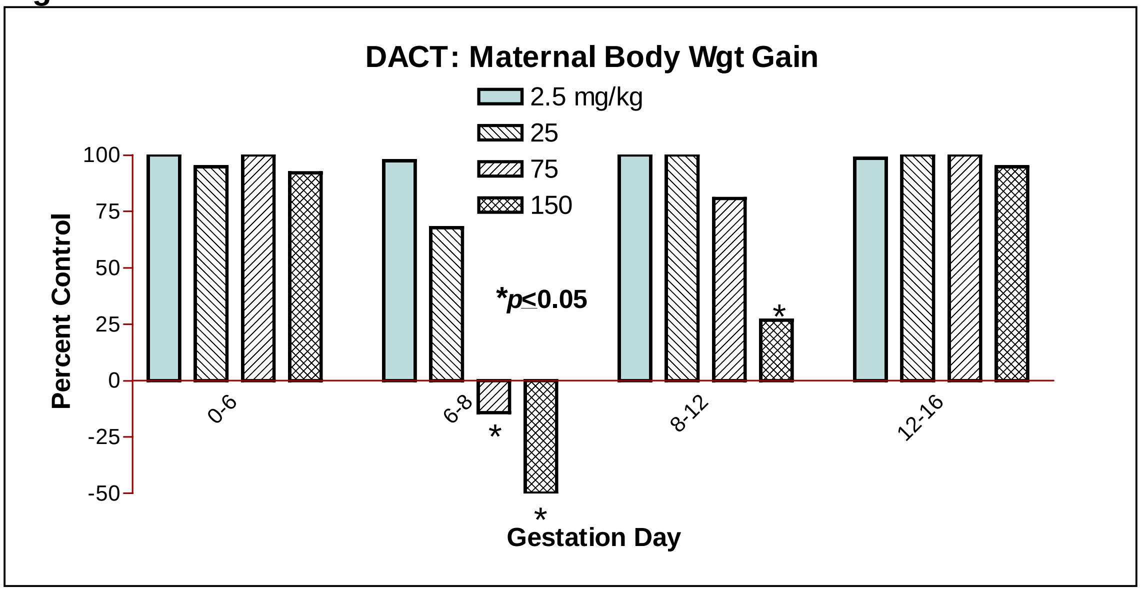
Syngenta continues to disagree with EPA that there is evidence to show that infants or children would be more susceptible to atrazine or DACT. The basis for EPA's conclusions are data interpretations that are not scientifically supportable, including the following two major points:

- that the DACT developmental study showed delayed ossification in pups at dose levels where the dams were not significantly affected; and
- that delayed puberty in both sexes and prostate inflammation was reported following exposure of the maternal rat to atrazine, suggesting that these effects occur at dose levels lower than dose levels causing maternal toxicity.

DACT Developmental Study

Reasonable evidence exists in the DACT developmental study to show that dams were significantly affected at the same dose levels as pups. In this study, statistically significant skeletal variations occurred at 25, 75, and 150 mg/kg/day. Note in the Figure 2 shown below that maternal body weight gain from gestation days 6-8 was statistically affected at 75 and 150 mg/kg/day. Although maternal body weight changes were not statistically significant for the 25 mg/kg/day group, the drop in body weight gain for these dams, as a group, was **32%**. A decrease of such magnitude is highly likely to delay skeletal development (see Khera, 1981).

Figure 2



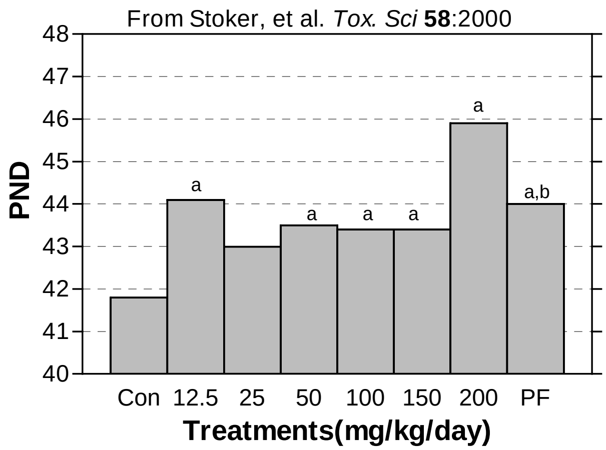
Further, one dam in the 25 mg/kg/day group began the study at a much heavier weight than the other dams. She weighed 290 grams at study start versus an average of 226 grams for the rest of the group. Applying Prochan's (1953) test for outlier data showed that this dam's body weight at the start of the study was statistically different from her dose level cohorts' weight. Then, in the first six days on test, before dosing, she *lost* 40 grams as opposed to an average weight *gain* by her cohorts of 42 grams. Her subsequent 31-gram body weight gain from gestation days 6 to 8 was much greater than the average for the rest of her group, which gained only 7 grams. Excluding this one dam from the 25 mg/kg/day group results in a 40% group mean body weight gain reduction from the control group mean. Thus, dams were affected at 25 mg/kg/day (reduced body weight gain), showing that there is no greater sensitivity to the developing fetus than to the dam.

Pubertal Male and Female Studies

In the Stoker, *et al*. (2000) study, preputial separation was concluded to be one of the most sensitive indicators of atrazine's effect on post-partum development in the male Wistar rat. Control group preputial separation, statistical relevance, and a lack of dose-response are three parameters that require further analyses or research and lead to questions about the NOEL of 6.3 mg/kg/day.

For reference, Figure 4 from the Stoker, *et al.* (2000) paper is reproduced here because it illustrates several important points (Figure 3). One is an understanding of when preputial separation occurs. As stated in the "Methods" section of this paper, preputial separation "…normally occurs between 40 and 50 days-of-age, with an average of 43 days…." This shows that the control group's preputial separation was earlier than usual.

Figure 3



Con=Controls; PF=Pair-Fed; a= $p<0.05$ compared to controls; b= $p<0.05$ compared to pair-fed

In addition, preputial separation was delayed in the control group that was pair-fed with the 200 mg/kg/day group. Whereas there may have been a slight delay due to reduction in food consumption and body weight, the day of preputial separation occurred within a typical range (~44 days). The 5% difference between control and pair-fed control in postnatal days to preputial separation is statistically different, suggesting that the control group's preputial separation is earlier than usual or that a decrease in weight appeared to result in the same effects as atrazine treatment at $\leq$ 150 mg/kg/day.

Since the control group (standard and pair-fed) time to preputial separation is between 42 and 44 days postnatal, the atrazine treatment groups, with the singular exception of the 200 mg/kg/day group, are within the typical range for preputial separation.

Finally, no obvious dose-response is seen in these data. Statistical significance from the control group that was not pair-fed was noted at all dose levels *except* 25 mg/kg/day, which was actually *earlier* than the 12.5 mg/kg/day treatment group. Furthermore, no dose-response relationship can be seen among the treated groups. One would assume that the 12-fold difference in dose level between the 12.5 and 150 mg/kg/day groups would have produced a *longer* delay in preputial separation, but there is actually a slight decrease.

Although there are statistical differences in time to preputial separation when compared to the standard control group, the differences are neither consistent (no statistical significance at 25 mg/kg/day), nor do they show a dose-response. This study shows that there is a delay in preputial separation in male Wistar rats dosed at 200 mg/kg/day, with a NOAEL of 150 mg/kg/day, not 6.25 mg/kg/day. Overall, this study shows a LOAEL of 50 mg/kg/day, based on reduction in ventral prostate weight, and a NOAEL of 25 mg/kg/day.

For the assessment of female endocrine-related effects, Laws, *et al*. (2000) showed that the age of vaginal opening was delayed in a dose-related fashion at 50, 100, and 200 mg atrazine/kg body weight/day. No effects were noted at 12.5 or 25 mg/kg/day, establishing 25 mg/kg/day as the NOAEL for female pubertal development.

Stoker, *et al.* (1999) showed an apparent NOAEL for atrazine's suppression of suckling-induced prolactin release in dams and for prostatitis that reportedly developed in pups nursed by these dams. The dams were dosed twice a day, seven hours apart (at 0900 and 1600 hours) at doses of 0, 6.25, 12.5, 25, or 50 mg/kg on postnatal days 1-4. As a consequence, dams received *nominal* daily doses of 2X each single dose, i.e. 0, 13, 25, or 100 mg/kg/day. But the actual biological availability of atrazine and atrazine metabolites probably does not perfectly fit a 2X scheme. Given the half-life of atrazine, the likely body burden (area under the curve) of two doses spaced seven hours apart would be proportionally greater than 2X. Therefore, strict comparisons of dose levels used in this study versus other, single daily dose studies would be inappropriate.

The conclusion in the 1999 Stoker *et al.* study is that suckling-induced prolactin release in dams occurred at a dose level of "25" mg/kg/day (12.5 X2), with a NOAEL of "13" mg/kg/day (6.25 X2). Prostatitis was noted in the 120 day-old pups from dams treated with "25", "50" or "100" mg/kg/day, with a NOAEL of "13" mg/kg/day. The co-occurrence of effects in dams and offspring at the same dose level indicates that there is no greater sensitivity to atrazine by the developing offspring.

Both the male and female pubertal assays performed at NHEERL showed clear NOAELs at 25 mg/kg/day. As indicated in Stoker's and Laws' publications and in EPA documents, these observed delays in pubertal development are related to a neuroendocrine mode of action.

Studies conducted by NHEERL and Syngenta have described endpoints that characterize the endocrine-related effects of atrazine and atrazine metabolites in Sprague-Dawley rats and related strains with sufficient certainty to establish consistent NOAELs. These NOAELs in young animals are either the same or are at higher dose levels than in adult animals, providing ample evidence that infants and children are not at greater risk.

Sufficient data exist for both the mode of action and the related NOAELs such that no additional uncertainty factor is required.

Table 3: Toxicity Endpoints for Atrazine

Subpopulation/ Age	Toxicity Study NOEL (mg/kg/day)
Acute Exposure (1 Day)	
Females (13 - 50 Years)	10 mg/kg/day
Short Term Exposure (1-7 Days)	
Infants < 1 Year	13[a]
Children (1-6 Years)	6.3[b] & 50[c]
Children (7-12 Years)	6.3[b] & 50[c]
Female (13-50 Years)	40[d]
Male (13-19 Years)	40[d]
Male (20+)Years	40[d]
All	40[d]
Intermediate Term Exposure (7 Days – Several Months)	
Infants < 1 Year	13[a]
Children (1-6 Years)	6.3[b] & 50[c]
Children (7-12 Years)	6.3[b] & 50[c]
Male or females (13-50 Years)	40[d]
All	40[d]
Long Term Exposure 3 Months – Lifetime	
All Subgroups	3.65[c]
All Subgroups	40[f,g]

[a]Developmental NOEL = 13 mg/kg/day (Male Wistar Rat) Effect on prolactin/prostatitis (Stoker et al., 1999).
[b]Developmental NOEL = 6.3 mg/kg/day (Male Wistar Rat) Effect on preputial separation (Stoker et al., 2000) ;
[c]Developmental NOEL = 50 mg/kg/day (Male SD Rat) Effect on preputial separation (Trentacosta et al. In press);
[d]See Attachment 1, Appendix B and E.
[e]See Attachment 1, Appendix B.
[f]Chronic NOEL = 40 mg/kg/day; (Female Fischer 344 Rat) Estrous cycle disruption (Thakur A.K, 1991)
[g]Chronic NOEL = 40 mg/kg/day (Fischer-344 rats) LH surge suppression (Minnema et al., 2001, See Appendix C).

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Minnema, D.J., Breckenridge, C.B., Eldridge, J.C., McFarland, J., and Stevens, J.T. 2001. Effect Of 6 Months Feeding Of Atrazine, Simazine Or A Common Metabolite, Diaminochloro-Triazine, On The Luteinizing Hormone Surge In Female Sprague-Dawley Rats (from Minnema, 2001b; presented at the Society of Toxicology Meeting in San Francisco, CA, March 28th, 2001, Abstract 1524).

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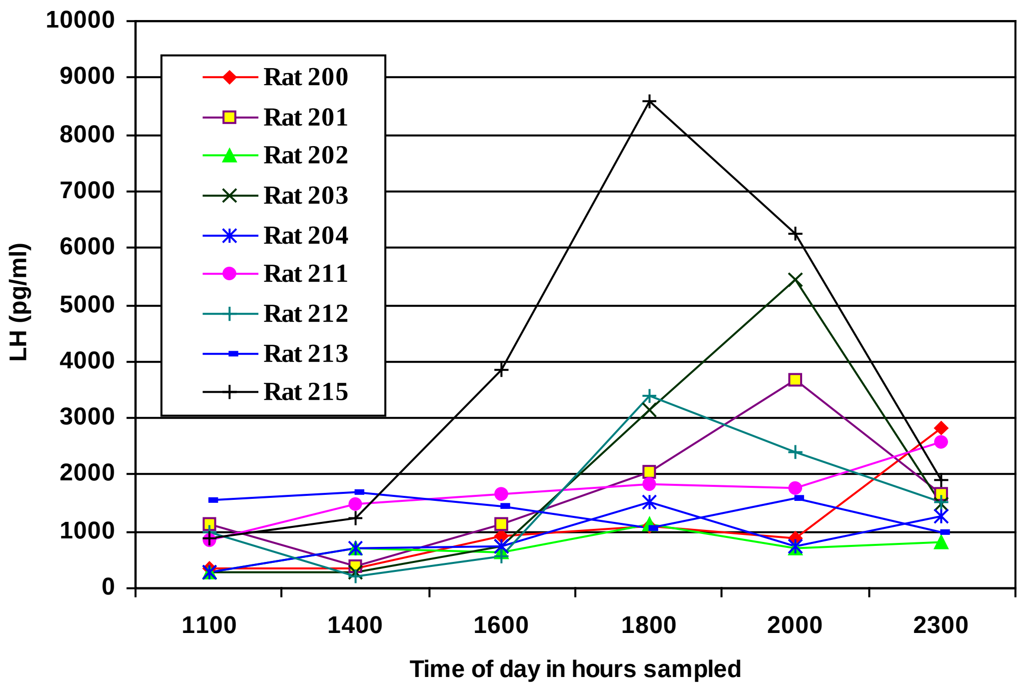
Appendix A of Attachment 1

The Inappropriateness of Non-repeat Sampling for Monitoring Plasma Luteinizing Hormone (LH) Surge in Estrogen-primed Ovariectomized Rats (Morseth, 1996a, 1996b)

There is tremendous inherent variability among animals and humans in endocrine states in terms of both stages and hormonal levels. As the LH surge occurs uniquely in each female rodent, it is essential, both from statistical as well as biological standpoints, that each subject is monitored repeatedly so that she can serve as her own controls. This is particularly true for typical sample sizes for this type of studies. Hence, even when the LH surge is monitored in artificially contrived estrogen-primed ovariectomized female, if one animal provides one point for the LH response curve, there will be an increased level of uncertainty associated with that measurement as result of the individual animal variability. This is clearly illustrated from curves that were generated for the control repeat animals shown in Figure 1 from the 1-month study with atrazine (Morseth, 1996a).

Figure 1. Repeat measure sampling of individual animals to build LH Surge curves for ovariectomized E2-primed control Sprague-Dawley female rats after 1 month on test.



The difficulty of interpreting anything meaningful from the data obtained from a single point plasma sample from a female ovariectomized estrogen-primed rat become more evident when one looks at the data collected from individual control rats after 1-month on study [Morseth, 1996a]. These data are presented in summary in Table 1 and as a scatter diagram in Figure 2.

Table 1. Mean plasma LH levels measured from individual samples obtained from 78 control females killed at designated times during the LH surge monitoring female after 1-month on study (Morseth, 1996a)

Hour	1100	1400	1600	1800	2000	2300
N	10	15	15	13	15	10
Mean	998	1122	3315	5158	2242	761
SD	614	564	2684	4403	1850	288

Figure 2. A scatter diagram for LH levels for timed bleeds of from 80 female ovariectomized estrogen–primed control rats after 1-month on test (Morseth, 1996a).

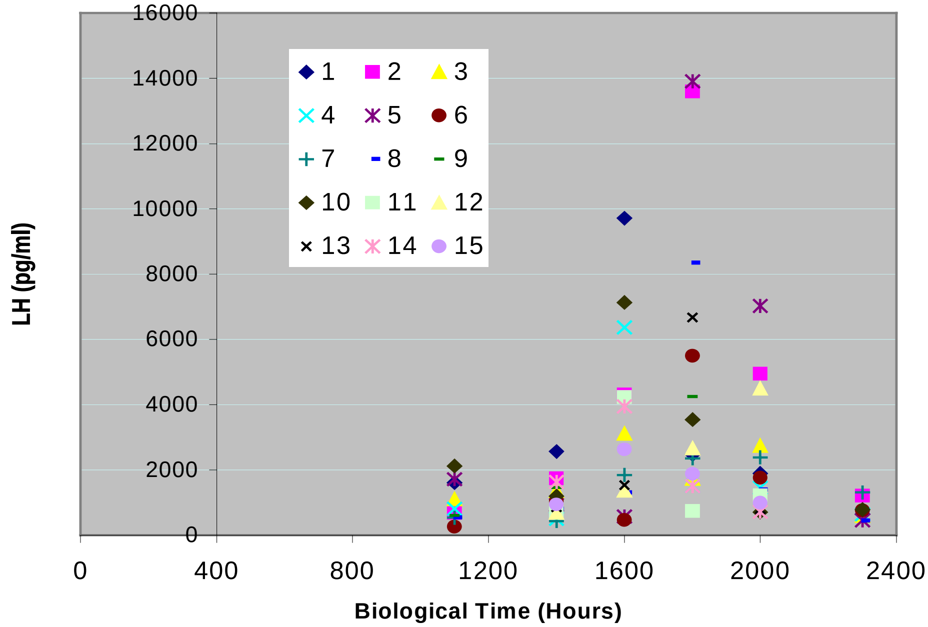


Table 2 and Figure 3 provides the mean plasma LH values and standard deviations for the 320 ovariectomized, estrogen-primed female S-D rats used for the non-repeated bleed portion of the 6-month LH surge study with atrazine (Morseth, 1996b).

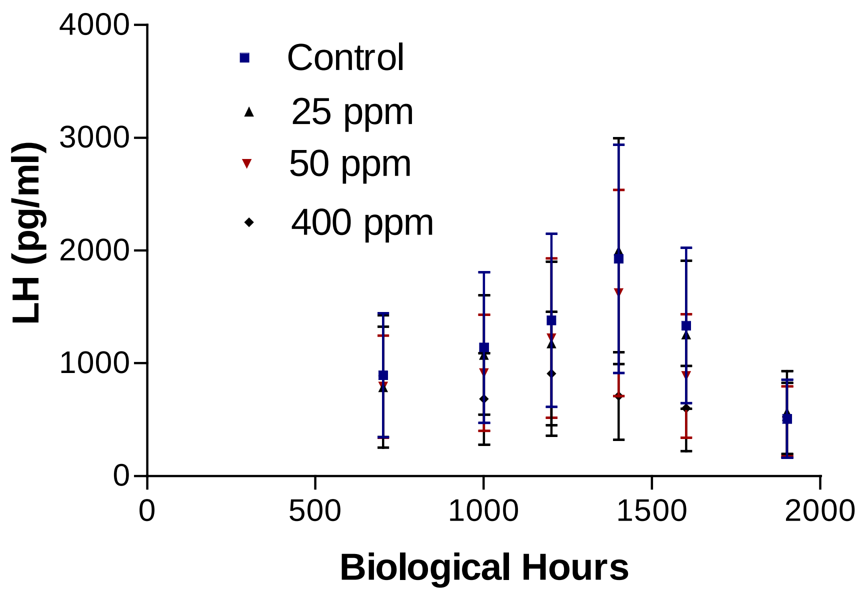
Table 2. Mean plasma LH levels (SD) measured from individual samples obtained ovariectomized estrogen-primed S-D female rat killed at designated times for the 6-month atrazine LH surge study (Morseth, 1996b).

Atrazine (ppm)	Hour	0700	1000	1200	1400	1600	1900
0	N	9	15	15	15	14	10
	Mean	1900	2326	2669	3456	2327	1178
	SD[1]	775	1082	1464 [2]	2310	1668	337
25	N	10	15	15	15	14	10
	Mean	1816	1606	2507	3235	2249	1258
	SD	543	926	1008	2751	1498	428
50	N	10	15	14	15	15	10
	Mean	1581	1799	2463	3175	1899	1063
	SD	791	933	1201	1685	752	383
400	N	10	15	15	15	15	10
	Mean	1863	1420	1913	1358	1308	1129
	SD	788	622	799	760	477	350

[1] SD = Standard Deviation

[2] Cases for which the SD is appropriately equal to or greater than half the mean

Figure 3. Variability in Non-repeat LH data for 6-month study with atrazine (Morseth, 1996b)



These data reveal the high degree of variability associated with this type of data and the fact that there is no distinct link among the values collected at each time point, i.e., an absolute independence the unique animal features maintained with repeat measures sampling.

In summary, non-repeat sampling provides limited capture of information concerning a given animal rat (one datapoint on the entire LH response curve). The high degree of within-animal variability in regard to biological timing of the surge makes it difficult without significantly increasing the sample size to discern any measurable, meaningful differences between control animals and treated animals. Therefore, this approach has been abandoned for a more biologically-relevant and more efficient repeat-measures sampling of the individual animal.

References

1. Morseth, S.L. 1996a. Evaluation of the Luteinizing Hormone (LH) Surge in Atrazine-Exposed Female Sprague-Dawley Rats (Study No. CHV 2386-111). Submitted February 2, 1996 to Public Docket OPP-30000-60. 2 Volumes (EPA MRID No. 43934406).

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Appendix B of Attachment 1

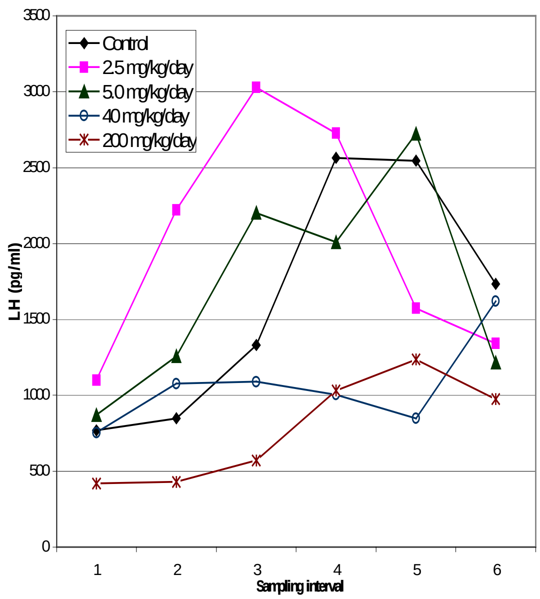
The Importance of Re-scaling the Time Axis for the Luteinizing Hormone (LH) Surge Data for Individual Rats to Peak

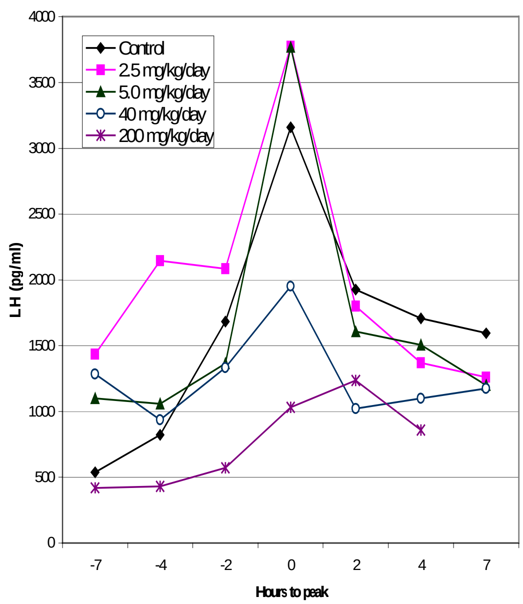
The repeat measure technique, i.e., monitoring the serum LH levels by sampling from an individual ovariectomized estrogen-primed female rat during the LH surge, is superior to measuring one serum LH at a specific time during the surge in one rat. However, with repeat measure techniques there it still a need to correct for the within animal variation for the time occurrence of the surge.

As can be seen in Figure 1 it is difficult to establish peaks if individual animal variation in the occurrence of their peak for the LH surge is not re-scaled on the time axis. However, if the peak for each animal is determined and time axis for the individual animal data is re-scaled to zero time (Cooper et al., 1999) on peaks (Figure 2), it is possible to clearly examine the effect of treatment on the LH surge.

Figure 1. Non-time re-scaled LH surge curves after 1-mo. of atrazine dosing of ovx'd E2-primed female S-D rats (Morseth, 1996a)

Figure 2. Time re-scaled LH surges 1-mo. of atrazine dosing of ovx'd E2-primed female S-D rats (Morseth, 1996a)





Even with the time re-scaled curves, the LH peak and the average pre-peak, peak, post-peak intervals for the 200-mg/kg/day group was not significantly diminished compared to the control group because of the high level of variability among animals and the reduced number of animals.

If a peak is not observed during the measurement peak, data for these animals can be eliminated from the assessment of peak effects, but be used instead to examine the possible impact of treatment on the delaying of the LH surge. The incidence data for delay of the LH surge for the 1-month LH surge study (Morseth, 1996a) is given in Table 1.

Table 1. The incidence for delayed peaks for LH surge for ovariectomized, estrogen-primed female S-D rats treated with atrazine for 1-month (Morseth, 1996a).

Treatment (mg/kg/day)	0	2.5	5.0	40	200
Incidence of peak delay	0/9	0/10	0/9	1/10	5/10*

* Different from the control using a one-sided Fisher's Exact Test at $P \leq 0.05$.

Two-hundred mg/kg/day dose group was considered to have an effect on delaying the LH surge. The NOEL for this experiment was 40 mg/kg/day.

The one month atrazine LH surge (Minnema, 2001a) does not use non-repeat measures, which were abandoned due to variability and excessive animal use difficulties and only used repeat measures testing and re-scaling of the time axis on individual animals peaks. Figure 3 represents these data following 1-month of atrazine treatment and Figure 4 shows the time axis for the individual rat data when re-scaled to zero time.

Figure 3. Non-time re-scaled LH surge curves after 1-mo. of atrazine dosing of ovx'd E2-primed female S-D rats (Minnema, 2001a)

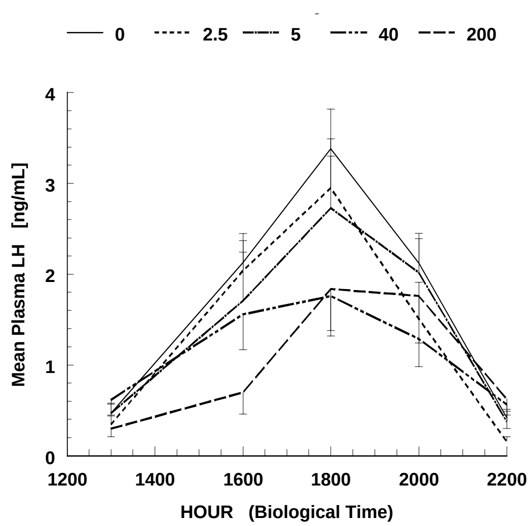
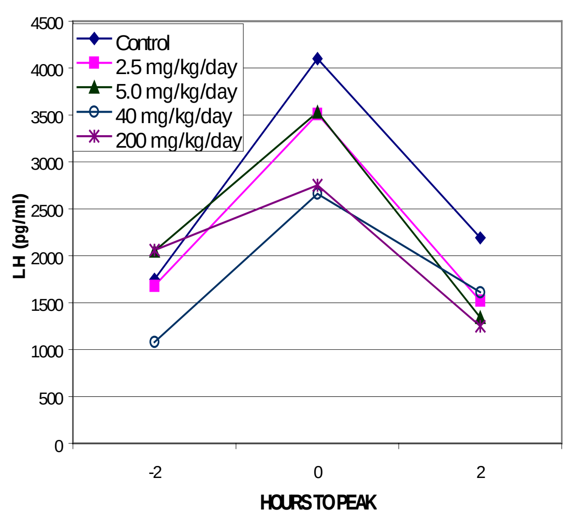


Figure 4. Time re-scaled LH surges 1-mo. of atrazine dosing of ovx'd E2-primed female S-D rats (Minnema, 2001a)



The time re-scaled peak and the average re-scaled pre-peak, peak, post-peak intervals were reduced for the 200-mg/kg/day group which was significantly different from the control. The 40-mg/kg/day group was different from the control group for peak but not the average pre-peak, peak, post-peak intervals. Therefore, the NOEL is considered to be at least 5 mg/kg/day.

If a peak is not observed during the measurement peak, data for these animals can be eliminated from the assessment of peak effects, but be used to examine the possible impact of treatment on the delaying the LH surge. The incidence data for delay of the LH surge for the 1-month LH surge study (Minnema, 2001a) is given in Table 2.

Table 2. The incidence for delayed peaks for LH surge for ovariectomized, estrogen-primed female S-D rats treated with atrazine for 1-month (Minnema, 2001a).

Treatment (mg/kg/day)	0	2.5	5.0	40	200
Incidence of peak delay	2/37	2/20	0/18	3/18	5/20*

* Different from the control using one-sided Fisher's Exact Test at P$\leq$ 0.05.

Similarly this technique of re-scaling on the time axis of the peaks was applied to LH surge data collected after 6-months of administration of atrazine in the diets of S-D female rats (Morseth, 1996b). The non-time re-scaled and time re-scaled LH curves are presented in Figures 5 and 6, respectively.

Figure 5. Non-normalized LH Surge Curves for Ovx'ed, E2-primed female S-D rats fed atrazine for 6-months (Morseth, 1996b).

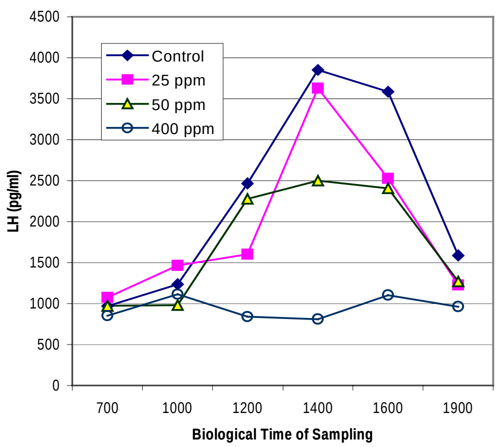
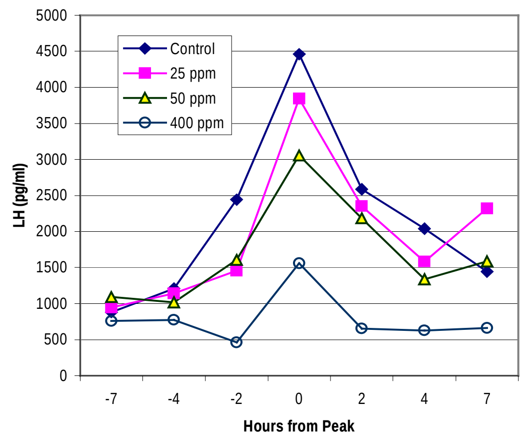


Figure 6. Normalized LH Surge Curves for Ovx'ed, E2-primed female S-D rats fed atrazine for 6-months (Morseth, 1996b).



The average pre-peak, peak, post-peak intervals were reduced at 400-ppm group time re-scaled on the peak was different from the control (Morseth, 1996b). This finding was confirmed for atrazine in an additional 6-month study (Minnema, 2001b). Atrazine produced a significantly different reduction in the LH surge compared to the control group at 400-ppm only (See Appendix C of Attachment 1; Minnema et al., 2001).

No differences from the control was noted for delay in the LH surge among the atrazine fed group for the 6-month LH surge study (Morseth, 1996b) - Table 3.

Table 3. The incidence for delayed peaks for LH surge for ovariectomized, estrogen-primed female S-D rats treated with atrazine for 6-months (Morseth, 1996b).

Treatment (ppm)	0	25	50	400
Incidence of peak delay	1/9	0/10	0/10	1/9

In summary, the use of repeat measures samples for LH surge evaluations are critical for reducing some of the inherent within animal variability. The re-scaling the time axis for individual animals based on the peaks for the surge affords a further enhancement to reduce variability and more appropriately assess treatment-related effects.

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3. Morseth, S.L. 1996b. Evaluation of the Luteinizing Hormone (LH) Surge in Atrazine-Exposed Female Sprague-Dawley Rats - 6 Month Study (Study No. CHV 2386-111). 2 Volumes Submitted October 30, 1996 (EPA MRID No. 44152102)

4. Minnema, D.J. 2001a. Atrazine, Simazine and Diaminochloro-triazine: Comparison of LH Surge in Female Rats Administered Oral Gavage for one month. Final Report. March 21, 2001. (Covance Study No. 6117-398, Syngenta 1198-98).

5. Minnema, D. J. 2001b. 52-Week Toxicity Study of Simazine, Atrazine, and DACT Administered in the Diet to Female Rats. Covance Study No. 6117-399. Study in Progress.

6. Minnema, D.J., Breckenridge, C.B., Eldridge, J.C., McFarland, J., and Stevens, J.T. 2001. Effect Of 6 Months Feeding Of Atrazine, Simazine Or A Common Metabolite, Diaminochloro-Triazine, On The Luteinizing Hormone Surge In Female Sprague-Dawley Rats (from Minnema, 2001b; presented at the Society of Toxicology Meeting in San Francisco, CA, March 28th, 2001, Abstract 1524).

Appendix C of Attachment 1

Effect Of 6 Months Feeding Of Atrazine, Simazine Or A Common Metabolite, Diaminochloro-Triazine, On The Luteinizing Hormone Surge In Female Sprague-Dawley Rats (from Minnema, 2001b; presented at the Society of Toxicology Meeting in San Francisco, CA, March 28th, 2001, Abstract 1524)

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Executive Summary

Equimolar concentrations of atrazine (25, 50, 70, 400 ppm or average dietary concentrations of 0.9, 2.7, 3.0, and 22.4 mg/kg/day, respectively), simazine (23, 47, 66, 374 ppm or average dietary concentrations of 0.8, 1.6, 3.7, and 15.6 mg/kg/day, respectively)) and diamino-chloro-triazine (DACT) (17, 34, 48, 270 ppm or average dietary concentrations of 1.9, 3.2, and 16.7 mg/kg/day, respectively) were fed to groups of 16 female Sprague-Dawley (S-D) rats (6-8 wk old) for 6 months; a concomitant control group of 32 female S-D rats was maintained. All animals were ovariectomized during wk 25 of administration and 6 days later a silastic estradiol capsule was implanted subcutaneously. Three days after the estradiol implant, each animal was bled from the jugular vein at 0900, 1200, 1400, 1600, 1800, and 2000 hrs. Plasma luteinizing hormone (LH) levels and estradiol were measured using radioimmunoassay. LH values for the selected sampling intervals were normalized on the peak levels. Six months of feeding equimolar concentrations of atrazine (400 ppm or 22.4 mg/kg/day), simazine (374 ppm or 15.6 mg/kg/day) and DACT (270 ppm or 16.7 mg/kg/day) resulted in a comparable, significant reduction in the LH surge. No effect of treatment on the LH surge with atrazine (3.0 mg/kg/day), simazine (3.7 mg/kg/day) or DACT (3.2 mg/kg/day) was present at molar equivalent levels 70 ppm of atrazine.

Methods

Animals: Female Sprague-Dawley rats were received from Charles River (Raleigh, NC) at 5-6 wks of age. The in-life phases were conducted at Covance Laboratories, Vienna, VA. Animal housing was illuminated for 12 hr/day. The mid-point of the light phase was designated as “noon”.

Treatments: Technical grade atrazine (97.5% pure), simazine (95.8% pure) and DACT (97.1% pure) were supplied by Novartis Crop Protection. All concentrations were normalized to provide equimolar dosing of each compound such that the final achieved doses were 0.116, 0.232. 0.325 and 1.854 μg/kg/day for the 25, 50, 70 and 400 ppm atrazine-equivalent feeding levels, respectively. Animals were fed their assigned treatments for 26 wks, up to the day of sacrifice.

<u>LH Surge Analysis</u>: After 25 wks treatment, all animals were ovariectomized and a silastic capsule containing 4 mg/ml estradiol in sesame oil was implanted subcutaneously. Three days later, all animals were bled at 09.00 from the jugular vein to remove 0.5 ml whole blood. Additional samples were removed at 12.00 (noon), 14.00, 16.00, 18.00 and 11.00 the following morning, just prior to terminal euthanasia. Each blood sample was centrifuged to prepare plasma that was frozen.

<u>Hormone Measures</u>: Levels of luteinizing hormone (LH) were measured in each sample, by double-antibody RIA, at Wake Forest University. NHPP (NIH) reagents were used, and Dr. Albert Parlow is acknowledged for his generous provision of reagents. Estradiol was measured in terminal samples, as a quality control check on the silastic implant, by solid-phase RIA reagents obtained from Diagnostic Products Corp (Los Angeles, CA).

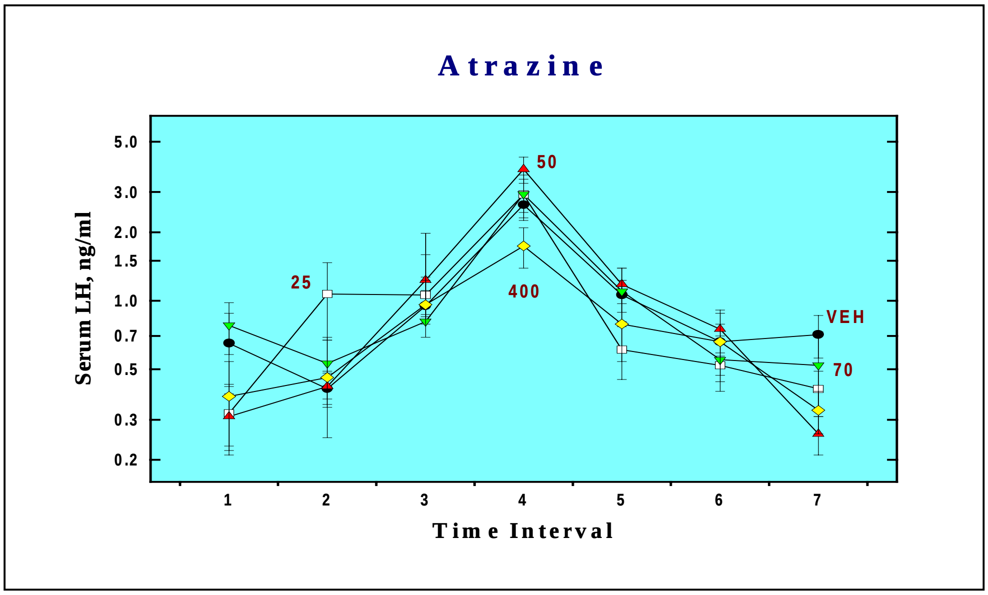
<u>Data Analyses</u>: LH data were normalized in time so that each animal's peak value was placed at "Interval 4". Treatment group means ± SEM were calculated and plotted on log scales. Comparisons of peaks were made using the Wilcoxon-Mann-Whitney ranked sum test. A probability of 0.05 or less is indicated as a significant difference of overall surge peaks.

Results

Atrazine

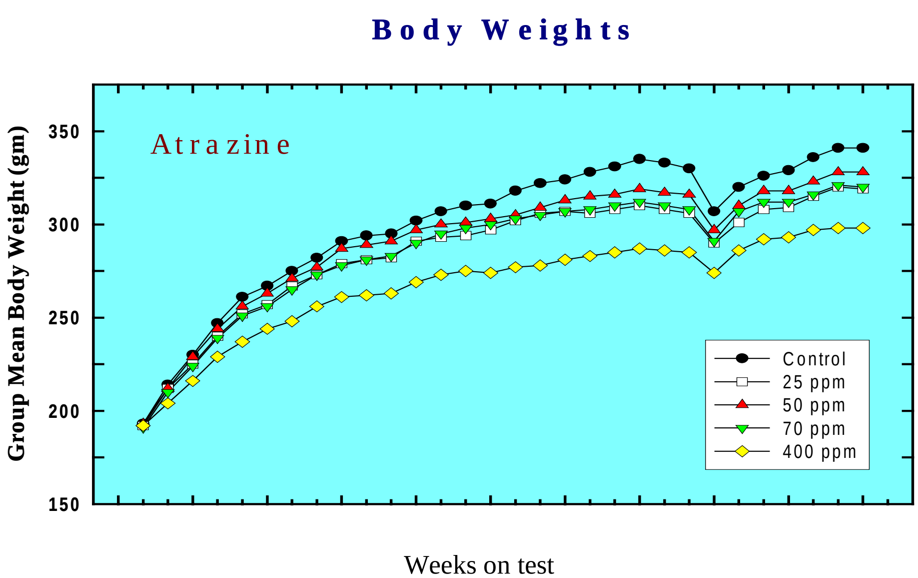
Exposure of rats to dietary atrazine at the level of 400 ppm (~22.4 mg/kg/day) for a period of 6 months resulted in a significant reduction ($p \leq 0.05$) in the estrogen-induced LH surge in ovariectomized female S-D rats compared to the control animals (Figure 1). The NOEL for this response was 70 ppm ($\geq$ 3.0 mg/kg/day)

Figure 1. Normalized LH surges in S-D female rats fed atrazine in diet for 6 month. The peak for the LH surge was diminished at 400 ppm group (p ≤ 0.05), but no differences from the controls were seen at the other feeding levels.



Atrazine fed at 400 ppm also suppressed the body weight gain when compared to the control group. (Figure 2).

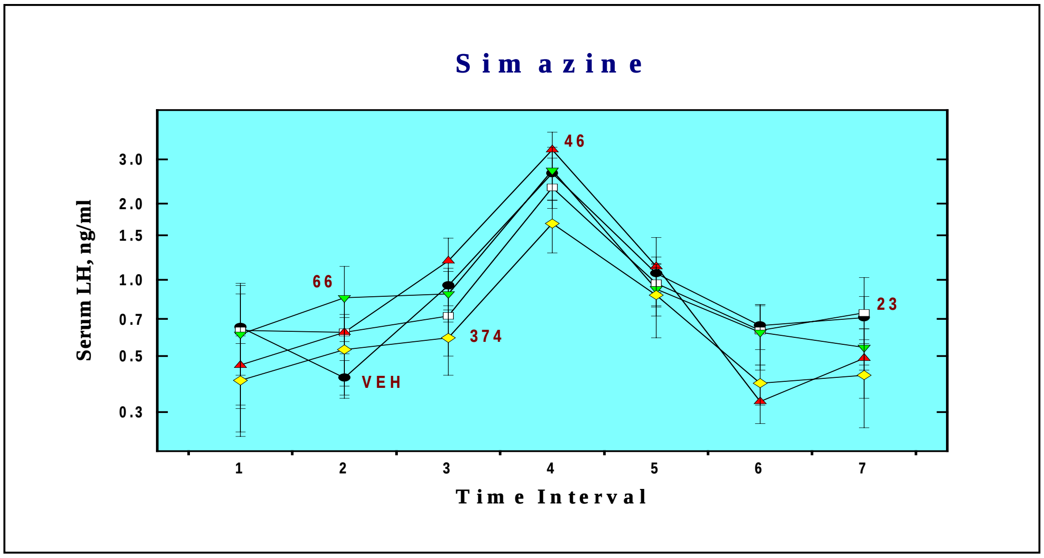
Figure 2. The effect of 6-months of feeding of atrazine on body weight gain.



Simazine

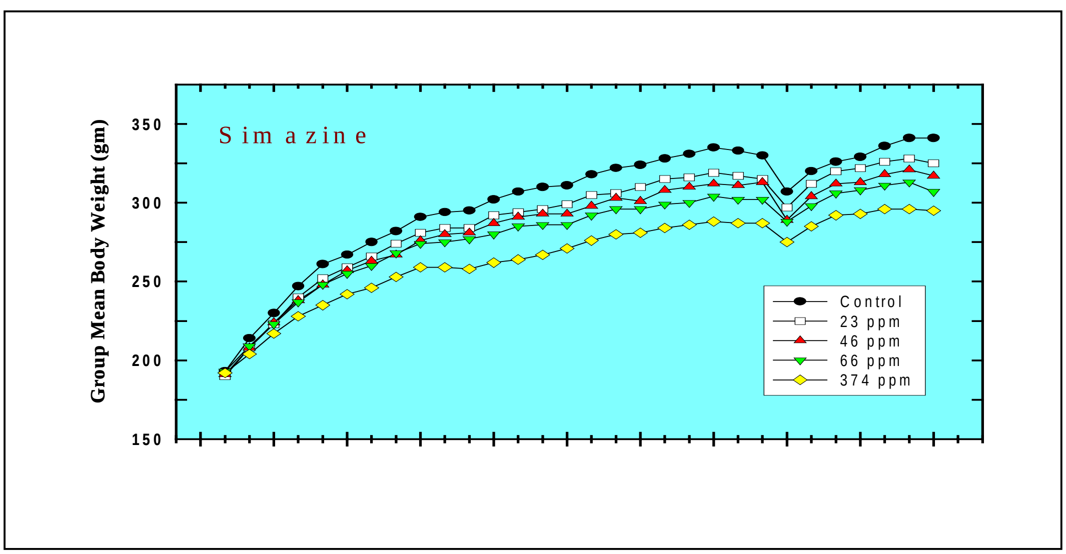
Exposure of rats to dietary simazine at the level of 374 ppm (~15.6 mg/kg/day) for a period of 6 months resulted in a significant reduction (p≤0.05) in the estrogen-induced LH surge in ovariectomized female S-D rats compared to the control animals (Figure 3). The NOEL for this response was 66 ppm (≤ 3.7 mg/kg/day)

Figure 3. LH surges in S-D female rats fed simazine in diet for 6 months. The LH peak for rats fed 374 ppm (equimolar to 400 ppm atrazine) is significantly different from control rats ($p < 0.05$) but no differences from the controls were seen at the other feeding levels.



Simazine fed at 374 ppm also suppressed the body weight gain when compared to the control group. (Figure 4). No significant effects compared to the controls were seen at the other dietary levels.

Figure 4. The effect of 6-months of feeding of simazine on body weight gain.

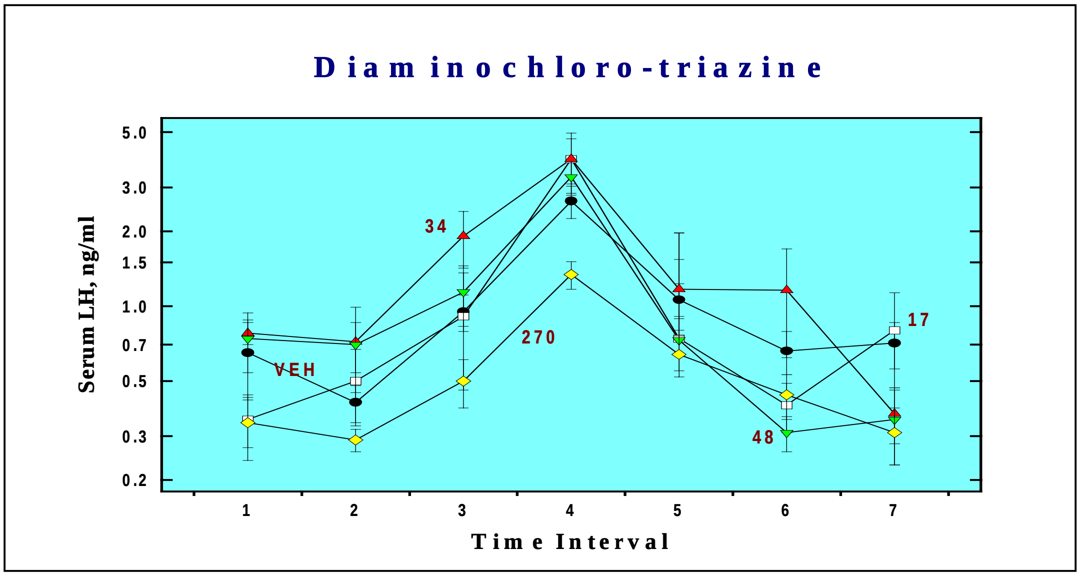


Weeks on test

Diaminochloro-triazine

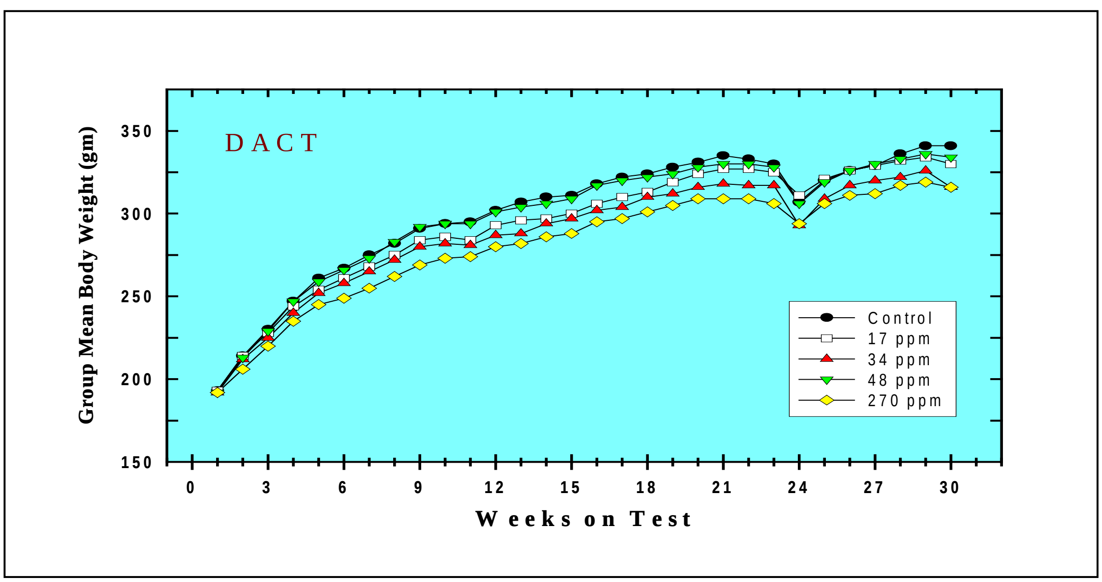
Exposure of rats to dietary diaminochloro-triazine at the level of 270 ppm (~16.7 mg/kg/day) for a period of 6 months resulted in a significant reduction ($p \leq 0.05$) in the estrogen-induced LH surge in ovariectomized female S-D rats compared to the control animals (Figure 5). The NOEL for this response was 66 ppm ($\geq$ 3.7 mg/kg/day)

Figure 5. LH surges in intact S-D female rats fed DACT in diet for 6 mo. Plot in 270 ppm group (equimolar to 400 ppm atrazine) is significantly different from the control rats ($p \leq 0.05$)



Diaminochloro-triazine fed at 270 ppm also suppressed the body weight gain when compared to the control group. (Figure 6). No significant effects compared to the controls were seen at the other dietary levels.

Figure 6. The effect of 6-months of feeding of diaminochloro-triazine on body weight gain.



CONCLUSIONS

Six months of oral dosing of female S-D rats with atrazine, simazine or diaminochloro-triazine, a common metabolite, resulted in significant reduction of estrogen-primed LH surges in ovariectomized rats only at equimolar concentrations administered in the highest dose groups. LH surge suppression was not significant at the next highest dose group. The degree of LH suppression was comparable for atrazine, simazine or diaminochloro-triazine in the highest dose groups. Body weight gains were suppressed at the highest dose for all three compounds with perhaps less effect on body weight gain noted with DACT than either atrazine or simazine.

REFERENCES

Minnema, D. J. 2001. 52-Week Toxicity Study of Simazine, Atrazine, and DACT Administered in the Diet to Female Rats. Covance Study No. 6117-399. Final Report May, 2001.

Appendix D of Attachment 1

The Effect Of 6 Months Feeding Of Atrazine Or Hydroxyatrazine On The Luteinizing Hormone Surge In Female Sprague-Dawley And Fischer-344 Rats

(from Minnema, 2001c; presented at the Society of Toxicology Meeting in San Francisco, CA, March 28th, 2001, Abstract 1525)

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Executive Summary

Atrazine was administered in the feed for 6 months at a level of 400 ppm to a group of 16 intact female Sprague-Dawley (S-D), two groups of ovariectomized female S-D and one group of intact female Fisher 344 (F-344) rats. An equimolar concentration of hydroxyatrazine (365.9 ppm) was fed to a group of 16 intact female S-D rats for 6 months. Equal numbers of females were assigned to appropriate control groups. During weeks 25-26 on test all intact rats were ovariectomized and a silastic estradiol tube was implanted subcutaneously 6 days later. Three days after the estradiol implant, animals were bled from the jugular vein at 0900, 1200, 1400, 1600, 1800, and 2000 hours. Plasma luteinizing hormone (LH) levels were measured by radioimmunoassay. LH values for the selected sampling intervals were normalized on the peak levels. The LH surge in control female S-D rats that were ovariectomized prior to study start was significantly greater than the LH surge of control female S-D rats that were ovariectomized during week 25-26. The LH surge of atrazine treated female S-D rats that were ovariectomized prior to study start was diminished in comparison to surges in ovariectomized, female controls. The LH surges of hydroxyatrazine-treated female S-D rats and atrazine-treated female F-344 rats were unaltered when compared to the appropriate controls. These results are consistent with the Brawer hypothesis (Brawer et al., 1993) that enhanced exposure to estrogens, even endogenous estrogens, causes an impairment of the LH surge and normal estrous cycling in female S-D rats. High doses of atrazine enhance endogenous estrogen exposure by disrupting the LH surge whereas hydroxyatrazine does not. Finally, the fact that the LH surge in the female F-344 rat was not affected by 400 ppm of atrazine, a dose that significantly reduced the LH surge in the female S-D rat, is likely due to differences in the aging process between these two strains of rats.

Introduction

Atrazine is a widely used triazine herbicide that is effective against broadleaf plants by virtue of its ability to inhibit the Hill reaction in photosynthesis. It is generally nontoxic to animal life at levels below the maximum tolerated dose. However, studies in Sprague-Dawley (SD) female rats have found disruptions of estrous cycling and ovulation at continual feeding of 400 ppm atrazine. Mode of action research has demonstrated that high doses of oral atrazine suppress the proestrous surge of LH that is necessary for ovulation in rats. LH surge suppression has been observed after 6 months of treatment, when the animals were 8-mo old, although the control animals were already beginning to show spontaneous disruptions of estrous cycling that typically occur in aging SD rats.

The present studies were designed to ask several related questions: (1) whether early senescence in the SD strain played a role by having female rats ovariectomized at 2 mo old and tested 6 mo later; (2) whether hydroxy-atrazine, a common plant metabolite, could inhibit LH surges as atrazine did; and (3) whether a second rat strain (Fischer-344), that is relatively resistant to premature senescence, would be similarly resistant to atrazine suppression of the LH surge.

Methods

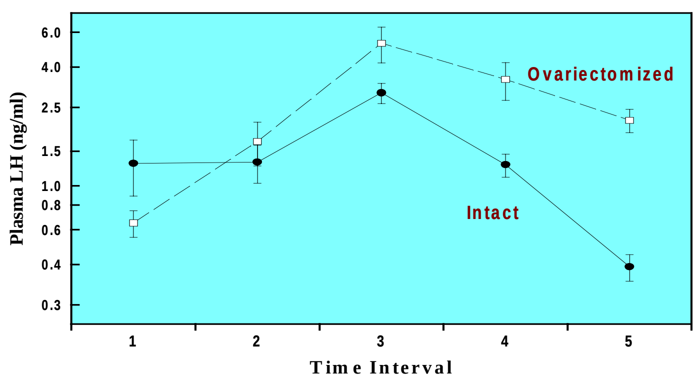
Animals: Female Sprague-Dawley and Fischer 344 rats were shipped from Charles River (Raleigh, NC) at 5-6 wks of age. The in-life phases were conducted at Covance Laboratories, Vienna, VA. Animal housing was illuminated for 12 hr/day. The mid-point of the phase was designated as "noon".
Treatments: Technical grade atrazine (97.5% pure) and hydroxy-atrazine (97.1% pure) were supplied by Novartis Crop Protection and mixed with pulverized rat chow at 400 ppm. Animals were fed their assigned treatments for 26 wks, exclusively to the day of sacrifice.
Ovariectomy: In groups labeled "ovariectomized" (OVX), the ovaries were removed just after quarantine (7-8 wks old), prior to initiation of treatment. All other groups remained intact until completion of 26 wks treatment, at which time they were OVX as well. A silastic capsule containing 100 mg/ml estradiol in sesame oil was implanted s.c.
LH Surge Analysis: Three days after pellet implantation, all animals were bled at 09.00 from the jugular vein to remove 0.5 ml whole blood. Additional samples were removed at 12.00 (noon), 14.00, 16.00, 18.00 and 11.00 the following morning, just prior to terminal euthanasia. Each blood sample was centrifuged to prepare plasma, that was frozen.
Hormone Measures: Levels of luteinizing hormone (LH) were measured in each sample, by double-antibody RIA, at Wake Forest University. NHPP (NIH) reagents were used, and Dr. Albert Parlow is acknowledged for his generous provision of reagents. Estradiol was measured in terminal samples by solid-phase RIA reagents obtained from Diagnostic Products Corp (Los Angeles, CA).
Data Analyses: LH results were normalized in time so that each animal's peak value was at "Interval 3". Means ± SEM are plotted on log scales. Comparisons of peaks were made using the Wilcoxon-Mann-Whitney ranked sum test. A probability of 0.05 or less is indicated as a significant difference of overall surge peaks.

Results

The LH surge for control S-D rats ovariectomized at 2 months was compared to control female ovariectomized at 8 month of age. These data presented in Figure 1 show the LH surge for rats left intact for 8-months had a significantly lower LH surge than those ovariectomized at 2 months of age ($p < 0.05$).

Figure 1. S-D rats were ovariectomized at 2 months of age and the LH surge was tested at 8 months of age.

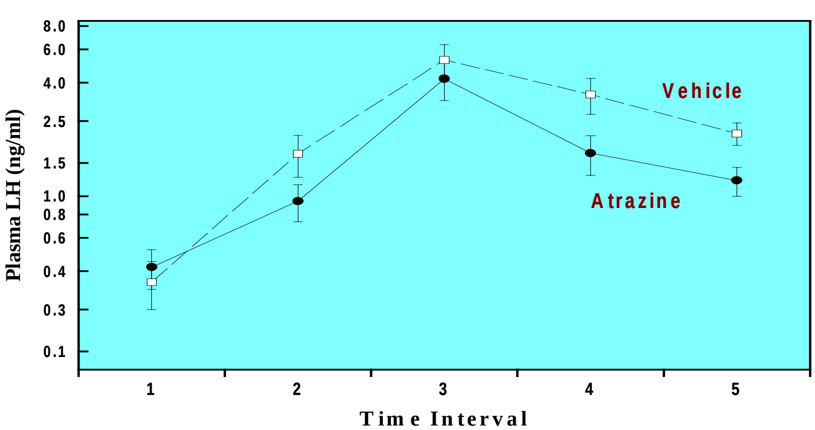
Sprague-Dawley, untreated, 8 mo. old



S-D rats were ovariectomized at 2 months of age and were then administered diet with or without 400 ppm atrazine. The LH surge was assessed after 6 months on test. In Figure 2, 400 ppm of atrazine significantly lowered the LH surge when compared to the control plot ($p < 0.05$).

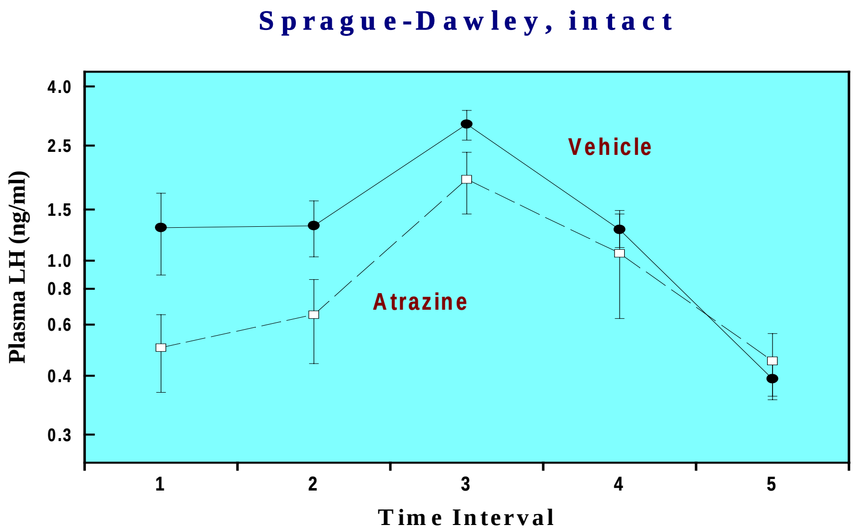
Figure 2. S-D rats were ovariectomized at 2 months of age and were then administered diet with or without 400-ppm atrazine.

Sprague-Dawley, ovariectomized



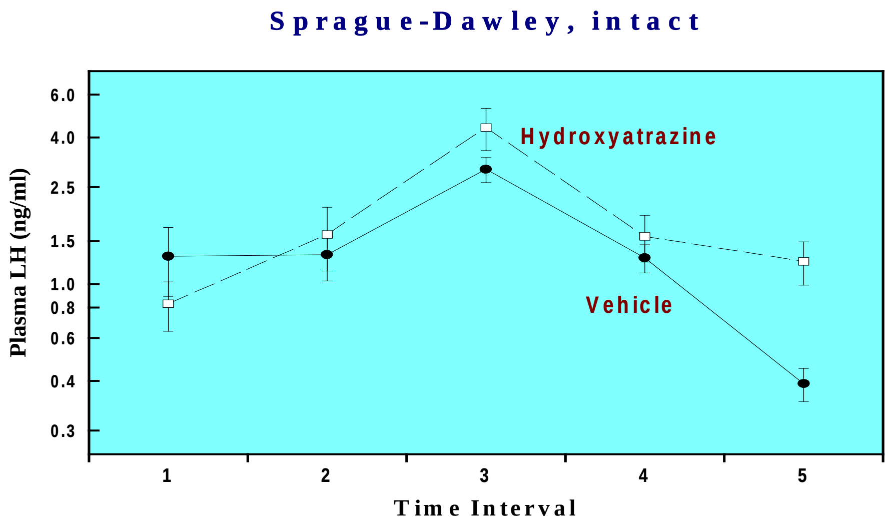
The LH surge was assessed after 6 months on test. The plot of atrazine data was significantly lower than the control plot ($p < 0.05$). These results are shown in Figure 3.

Figure 3. Comparison of the LH surge for the vehicle control females to the curve the group fed 400-ppm atrazine in their diet for six months.



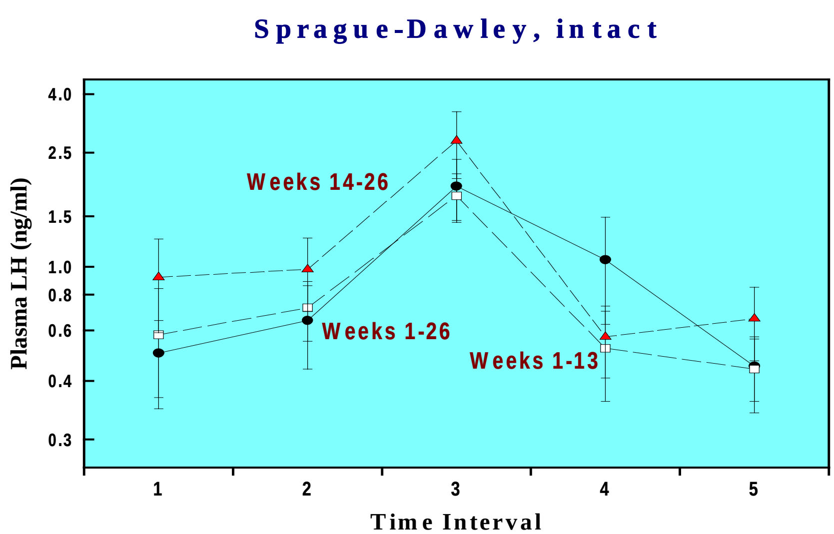
S-D rats were administered a diet with or without 400-ppm hydroxyatrazine, and the LH surge was assessed after 6 months on test. The hydroxyatrazine plot of values was not significantly different from the control plot (Figure 4).

Figure 4. Comparison of the LH surge for the vehicle control S-D females to the curve the group of S-D female rat fed 400 ppm of hydroxyatrazine in their diet for six months.



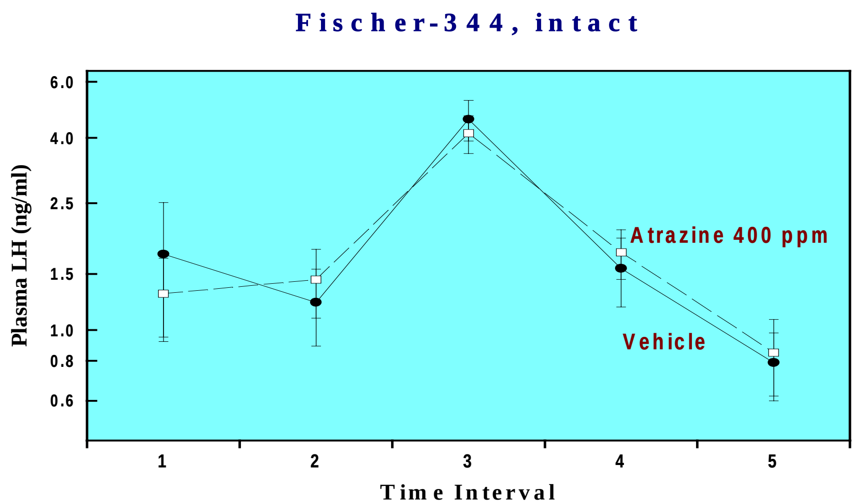
S-D rats were administered a diet with 400 ppm atrazine for weeks 1-13, 14-26 or 1-26 on test, and the LH surge was assessed thereafter. The LH data at 1-13 and 1-26 weeks were significantly lower than the 14-26 wk data, which were in turn not different from the control data (Figure 5).

Figure 5. Comparison of S-D rats administered a diet with 400-ppm atrazine for weeks 1-13, 14-26 or 1-26 on test, and the LH surge was assessed thereafter.



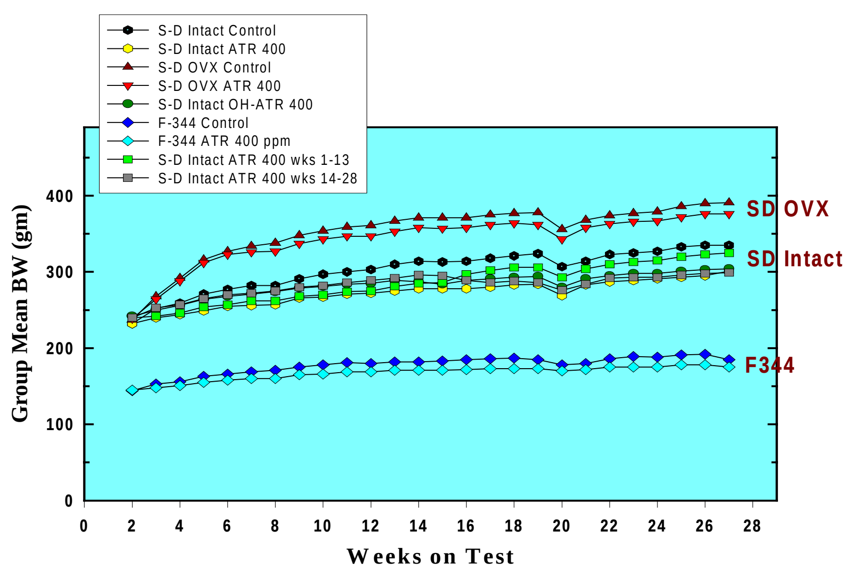
F344 rats were administered a diet with or without 400-ppm atrazine, and the LH surge was assessed after 6 months on test. The atrazine plot was not significantly different from the control plot (Figure 6).

Figure 6. Comparison of the LH surge for the vehicle control F344 females to the curve the group of F344 female rats fed 400 ppm of hydroxyatrazine in their diet for six months.



The body weights of all test groups are presented in Figure 7.

Figure 7. Mean body weights for all group throughout 6-month treatment period.



The administration of atrazine in the diet at 400 ppm significantly impacted body weight gain in all test groups in both F344 and S-D female rats. The decline at week 20 was caused by an SDAV infection in the housing facility.

Summary of Results

Eight-month old Sprague-Dawley rats, when ovariectomized at 2 months of age, had higher LH surges than intact 8-month old cohorts. Nevertheless, 6 months of atrazine dosing at 400 ppm significantly suppressed LH surges in OVX S-D rats, in a similar manner as observed in atrazine-treated intact rats. When intact S-D rats were administered 400 ppm atrazine for wks 1-13 on test, and switched to control diet for weeks 14-26, the LH surges were reduced as much as in animals treated for the full 1-26 week period. However, when animals were fed control diet for weeks 1-13, then switched to 400 ppm for wks 14-26, LH surge magnitude was retained at the level of animals fed control diet for the full 1-26 wk period. LH surges were not suppressed in intact S-D rats treated 6 months with 400 ppm hydroxy-atrazine, a plant metabolite. LH surges in intact Fischer-344 rats were unaffected by 400 ppm atrazine for 6 months.

CONCLUSIONS

- In S-D female rats, the presence of ovaries has already adversely affected the quality of LH surges by 8 month of age.
- Atrazine, administered for 6 months at 400-ppm, suppresses LH surges in S-D rats, whether ovariectomized or intact.
- Atrazine administered at 400-ppm during the first 3 months of a 6-month test has the same suppressive effect on LH surges as atrazine administered during the entire 6-month test.
- However, atrazine administered at 400-ppm during the final 3 months on test has no significant impact on LH surges.
- Hydroxyatrazine has no effect on LH surge quality, when administered at 400 ppm for 6 months
- LH surges in Fischer 344 rats are unaffected by 400-ppm atrazine administered for 6 months.

Reference

Brawer J.R., Beaudet, A., Desjardins, G.C., and Schipper, H.M. 1993. Pathologic effect of estradiol on the hypothalamus. *Biol Reprod* 49(4):647-52.

Appendix E of Attachment 1

A Statistical Evaluation of the Comparison of the LH Surge in Female Rats Administered Atrazine, or DACT via Oral Gavage for One Month (Covance 6117-398)

Executive Summary

The effects on the LH surge from daily oral (gavage) administration of diaminochloro-triazine (DACT), or atrazine at dose levels of 2.5, 5, 40 and 200 mg/kg/day for 28 days in female Sprague-Dawley rats were assessed. Treatment-related effects on the LH surge (relative to control) were noted for test materials. For atrazine, a statistically significant decrease in the LH surge, relative to control, was noted at the 200 mg/kg/day dose level. No statistically significant decreases in the LH surge were noted for atrazine at the 2.5, 5, or 40 mg/kg/day dose levels. A statistically significant decrease in the LH surge was noted for DACT at the 200 mg/kg/day dose level. No statistically significant decreases in the LH surge were noted for DACT at 2.5, 5, or 40 mg/kg/day dose levels when the analysis was performed on the peak LH values using parametric analysis. A barely statistically difference was seen at 40 mg/kg/day when nonparametric analysis was performed. Significant additional statistical analyzes are ongoing.

Purpose of the study

The purpose of this study was to evaluate the effects of atrazine and DACT administered once daily by oral gavage for at least 4 weeks on the preovulatory LH surge in female Sprague Dawley rats.

Statistical Evaluation

Statistics were applied consistent with using both parametric (ANOVA followed by Dunnett Multiple Comparison Test) and nonparametric (Dunn's Multiple Comparison Test) from Graphpad Instat software and ANOVA followed by Dunnett Multiple Comparison Test or pooled-variance t-comparison from the SAS Institute 2000 Program, Version 8. Only the peak height re-scaled on the time axis to zero after the method of Cooper *et al*., 1999 is included in this appendix.

Experiment Design:

The experimental design of the study was as indicated in Table 1.

Table 1. The experiment design of the 1-month study to examine the effect of atrazine and DACT on the preovulatory LH surge in Sprague-Dawley female rats.

	Dosage Level		Concentration	
Treatment	Mg/kg/day	µmoles/kg/day	mg/mL	Number of Females
Control	0	0	0	40
Low DACT)	2.5	17.2	0.25	20
Mid DACT	5	34.4	0.5	20
Mid-High DACT	40	274.9	4	20
High DACT	200	1374.6	20	20
Low Atrazine	2.5	11.6	0.25	20
Mid Atrazine	5	23.2	0.5	20
Mid-High Atrazine	40	185.4	4	20
High Atrazine	200	927.2	20	20

Note: Animals were assigned to sets according to the stagger start of the study over a 10-day period. Animals were assigned in consecutive order, with an equal distribution of animals assigned on each day (four animals per day for Group 1 and two animals per day for Groups 2-13). Dosage levels expressed as µmoles/kg/day are based on the following molecular weights: atrazine: 215.7 g/mole and DACT: 145.5 g/mole

Study Design Timetable

In the study timetable below, Day 1 was the first day of dosing with the appropriate test material. Dosing was performed at approximately 0630 (5½ hours after lights on) each day.

Day:	1 - 21	22	23 - 27	28	29-30	31
Procedure:	Dose once daily, daily vaginal smear	Dose, vaginal smear, ovariectomies	Dose once daily	Dose, ~1 hr later: Estradiol Implant	Dose once daily	Dose, Collect Postdose Blood Samples

Results

The results from statistical analysis of the re-scaled to peak LH surge analysis are presented in Table 2. The statistical printout for diaminochloro-triazine, and atrazine are presented in Addenda 1 and 2 of Attachment 1, Appendix E, respectively.

Table 2. Statistical evaluation of the re-scaled peak and peak triad LH surge for atrazine and diaminochloro-triazine in the 1-month gavage study. (Minnema, 2001 a): Difference from the control group.

Chemical	Method	Statistical test	Dose (mg/kg/day)			
			2.5	5.0	40	200
DACT	Peak	DMC[1]	NS[4]	NS	NS	P < 0.01
		t-comparison[2]	NS	NS	NS	P< 0.001[5]
		Dunn's[3]	NS	NS	NS	P< 0.001[5]
	Peak Triad	DMC	NS	NS	NS	P < 0.01
		t-comparison	NS	NS	P < 0.05	P< 0.001
Atrazine	Peak	DMC	NS	NS	NS	NS
		t-comparison	NS	NS	NS	NS
		Dunn's	NS	NS	NS	NS[5]
	Peak Triad	DMC	NS	NS	NS	NS
		t-comparison	NS	NS	NS	NS

[1] Dunnett Multiple Comparisons test
[2] Significant by the pooled-variance t-comparison
[3] Dunn's Multiple Comparisons Test
[4] Not significantly different from the control
[5] Also significantly increased incidence delay of LH surge as determined by one-sided Fisher's Exact Test.

DACT and atrazine appears to produce a clear high dose effect (200 mg/kg/day) on the preovulatory LH surge. The results from a 6-month feeding study with these chemicals showed that all these compounds produced an effect at equimolar doses of approximately 200 ppm but not effect at the next lower level of 70 ppm (Minnema, 2001b, Minnema *et al*., 2001).

References

Cooper, R.L., Goldman, J.M., and Stoker, T.E. 1999. Neuroendocrine and reproductive effects of contemporary-use pesticides. *Toxicol. Ind. Health*.15:26-36.

Minnema, D.J. 2001a. Atrazine, Simazine and Diaminochloro-triazine: Comparison of LH Surge in Female Rats Administered Oral Gavage for one month. Final Report. March 21, 2001. (Covance Study No. 6117-398, Syngenta 1198-98).

Minnema, D. J. 2001b. 52-Week Toxicity Study of Simazine, Atrazine, and DACT Administered in the Diet to Female Rats. Covance Study No. 6117-399. Report in Progress.

Minnema, D.J., Breckenridge, C.B., Eldridge, J.C., McFarland, J., and Stevens, J.T. 2001. Effect Of 6 Months Feeding Of Atrazine, Simazine Or A Common Metabolite, Diaminochloro-Triazine, On The Luteinizing Hormone Surge In Female Sprague-Dawley Rats (from Minnema, 2001b; presented at the Society of Toxicology Meeting in San Francisco, CA, March 28th, 2001, Abstract 1524).

Addendum 1 of Appendix E, Attachment 1
LH Surge peak evaluations for atrazine and DACT from the 1-month study
(Minnema, 20001a)

1) One-way Analysis of Variance (ANOVA)

The P value is 0.0209, considered significant.
Variation among column means is significantly greater than expected by chance.

2) Dunnett Multiple Comparisons Test

Control column: Control
If the value of q is greater than 2.686 then the P value is less than 0.05.

Comparison	Mean Difference	q	P value	
Control vs DACT- 2.5	1.101	1.667	ns	P>0.05
Control vs DACT - 5.0	0.8006	1.192	ns	P>0.05
Control vs DACT - 40	1.336	1.954	ns	P>0.05
Control vs DACT - 200	3.103	4.053	**	P<0.01
Control vs Atrazine - 2.5	0.5958	0.8870	ns	P>0.05
Control vs Atrazine - 5.0	0.5737	0.8392	ns	P>0.05
Control vs Atrazine – 40	1.248	1.631	ns	P>0.05
Control vs Atrazine - 200	1.352	1.901	ns	P>0.05

	Mean Difference 95% CI	Lower Difference 95% CI	Upper
Control - DACT- 2.5	1.101	-0.6732	2.876
Control - DACT-5.0	0.8006	-1.003	2.604
Control - DACT - 40	1.336	-0.5001	3.172
Control - DACT - 200	3.103	1.047	5.159
Control - Atrazine - 2.5	0.5958	-1.208	2.400
Control - Atrazine - 5.0	0.5737	-1.262	2.410
Control - Atrazine - 40	1.248	-0.8077	3.304
Control - Atrazine – 200	1.352	-0.5579	3.263

Assumption test: Are the standard deviations of the groups equal?

ANOVA assumes that the data are sampled from populations with identical SDs. This assumption is tested using the method of Bartlett.

Bartlett statistic (corrected) = 23.013
The P value is 0.0033.
Bartlett's test suggests that the differences among the SDs is very significant.

Since ANOVA assumes populations with equal SDs, you should consider transforming your data (reciprocal or log) or selecting a nonparametric test.

Assumption test: Are the data sampled from Gaussian distributions?

ANOVA assumes that the data are sampled from populations that follow Gaussian distributions. This assumption is tested using the method Kolmogorov and Smirnov:

Group	KS	P Value	Passed normality test?
Control	0.1177	>0.10	Yes
DACT- 2.5	0.1550	>0.10	Yes
DACT - 40	0.2058	>0.10	Yes
DACT - 200	0.1801	>0.10	Yes
Atrazine - 2.5	0.2343	>0.10	Yes
Atrazine - 5.0	0.2130	>0.10	Yes
Atrazine - 40	0.1669	>0.10	Yes
Atrazine - 200	0.3188	0.0774	Yes

Intermediate calculations. ANOVA table

Source of Variation	Degrees of freedom	Sum of squares	Mean square
Treatments (between columns)	8	104.08	13.010
Residuals (within columns)	162	900.09	5.556
Total	170	1004.2	

F = 2.342 =(MStreatment/MSresidual)

Summary of Data

Group	Number of Standard Point	Mean	Standard Deviation	Error of Mean	Median
Control	35	4.104	2.521	0.4262	3.610
DACT- 2.5	20	3.003	1.733	0.3874	2.670
DACT -5.0	19	3.303	3.410	0.7823	2.460
DACT - 40	18	2.768	1.993	0.4698	2.250
DACT - 200	13	1.001	1.042	0.2891	0.7300
Atrazine - 2.5	19	3.508	2.411	0.5532	2.820
Atrazine - 5.0	18	3.530	2.574	0.6066	2.890
Atrazine - 40	13	2.855	1.609	0.4463	3.170
Atrazine - 200	16	2.751	2.431	0.6079	1.900

			95% Confidence Interval	
Group	Minimum	Maximum	From	To
Control	0.1700	12.080	3.237	4.970
DACT- 2.5	0.8700	8.630	2.192	3.813
DACT - 5.0	0.2400	15.380	1.660	4.947
DACT - 40	0.2600	7.130	1.777	3.759
DACT - 200	0.09000	3.440	0.3707	1.631
Atrazine - 2.5	0.5900	9.620	2.346	4.670
Atrazine - 5.0	0.7300	11.190	2.250	4.810
Atrazine - 40	0.6900	6.020	1.883	3.828
Atrazine - 200	0.4400	7.940	1.456	4.047

3. Kruskal-Wallis Test (Nonparametric ANOVA)

The P value is 0.0006, considered extremely significant.
Variation among column medians is significantly greater than expected by chance.

The P value is approximate (from chi-square distribution) because at least one column has two or more identical values.

Calculation detail

Group	Number of Points	Sum of Ranks	Mean of Ranks
Control	35	3810.5	108.87
DACT- 2.5	20	1796.0	89.800
DACT - 5.0	19	1569.5	82.605
DACT - 40	18	1411.5	78.417
DACT - 200	13	382.50	29.423
Atrazine - 2.5	19	774.0	93.368
Atrazine - 5.0	18	1696.0	94.222
Atrazine - 40	13	1120.0	86.154
Atrazine - 200	16	1146.0	71.625

Kruskal-Wallis Statistic KW = 27.344 (corrected for ties)

4) Dunn's Multiple Comparisons Test

Comparison	Mean Rank Difference	P value
Control vs. DACT- 2.5	19.071	ns P>0.05
Control vs. DACT - 5.0	26.266	ns P>0.05
Control vs. DACT - 40	30.455	ns P>0.05
Control vs. DACT - 200	79.448	*** P<0.001
Control vs. Atrazine - 2.5	15.503	ns P>0.05
Control vs. Atrazine - 5.0	14.649	ns P>0.05
Control vs. Atrazine - 40	2.718	ns P>0.05
Control vs. Atrazine - 200	37.246	ns P>0.05

Summary of Data

Group	Number of Points	Median	Minimum	Maximum
Control	35	3.610	0.1700	12.080
DACT- 2.5	20	2.670	0.8700	8.630
DACT - 5.0	19	2.460	0.2400	15.380
DACT - 40	18	2.250	0.2600	7.130
DACT - 200	13	0.7300	0.09000	3.440
Atrazine - 2.5	19	2.820	0.5900	9.620
Atrazine - 5.0	18	2.890	0.7300	11.190
Atrazine - 40	13	3.170	0.6900	6.020
Atrazine - 200	16	1.900	0.4400	7.940

Addendum 2 of Appendix E, Attachment 1

Comparison of the LH Surge in Female Rats Administered Atrazine or DACT via Oral Gavage for One Month

Statistical Analysis Summary

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Data

The relevant data for this statistical analysis consist of peak LH levels (ng/ml) for each animal as well as the levels obtained at the previous (pre-peak) and succeeding (post-peak) sample times. These sampling times were 2-3 hours apart. Data were available for animals in 9 separate treatment groups. These are a single vehicle control group and 4 dose groups for each of 2 chemicals (atrazine and DACT). The dose levels were identical for both chemicals (2.5, 5, 40, and 200 mg/kg/day). All data processing and statistical analyses were conducted using Version 8 of the SAS statistical analysis program (SAS Institute, 2000).

Statistical Analysis

Both peak LH levels and peak triad mean levels (the average of the pre-peak, peak, and post-peak LH values for each animal) were analyzed for treatment differences in a one-way analysis of variance (ANOVA). It is possible to analyze these data in a more complex repeated-measures ANOVA having two factors: chemical-dose combination (a between-animals factor) and time-point (a within-animal factor). Such an analysis, however, is unnecessarily complicated and of questionable validity. Since the peak levels were selected to be maximal, a comparison of time-points is redundant and statistically biased. There may be some validity in the repeated measures test for treatment × time-point interaction. But even if present, such interactions would be very difficult to interpret and are more properly treated as experimental measurement error. The only relevant portion of such a repeated measures analysis is the main-effect comparison between treatment levels. This, however, is identical with the simpler one-way ANOVA comparison that uses the peak triad mean. Thus, the current analysis already captures the only useful portion of the repeated measures ANOVA.

There is a suggestion in these data that the treatment group standard deviations (for both peak and for peak triad) increase linearly with the means. A test of homogeneity of variance using the Brown-Forsythe (1974) method, however, failed to find any substantial level of unequal variance. Thus, these data seem appropriate for a parametric ANOVA without additional transformation.

All treatment means were compared to the control using two different methods for determining statistical significance: a t-comparison and Dunnett's test (Winer, 1962). The t-comparison is simply a t-test that estimates underlying variability using all 13 groups. The Dunnett test uses the same t-statistic but computes statistical significance adjusting for the number of comparisons being made. Dunnett's test has a smaller frequency of false positives than does the t-comparison and is, thus, more conservative. Finally, separate tests for dose-order trend were computed for each chemical. Each trend test was implemented as an ANOVA contrast using the coefficients -2, -1, 0, 1, and 2 for the control, 2.5, 5, 40, and 200 mg/kg-day doses, respectively.

The overall ANOVA F-test of group differences was highly significant for both peak and peak triad mean LH levels. The results of comparisons to control are given in Table 1. As expected, the observed significance levels (p-values) for the Dunnett test are larger (i.e., less evidence for a difference) than those for the corresponding t comparisons. Both types of LH surge measures give similar results. Numerical decreases in LH levels are seen with high doses of all three chemicals although statistical significance (i.e., $p<0.05$) is not quite achieved with atrazine. DACT gives significant decreases from control at the 200 mg/kg/day dose. The evidence for a real decrease at the 40 mg/kg/day dose of DACT is much weaker. Clear statistical significance at this dose only occurs for peak triad mean LH using with the liberal t comparison. There is no statistical significance at the 5 mg/kg/day or 2.5 mg/kg/day doses.

The results for trend tests are summarized in Table 2. Both chemicals show statistically significant decreases in peak LH levels with dose. For peak triad mean LH levels, the trend with atrazine dose has a borderline statistical significance ($p=0.0564$). DACT shows strong evidence of a dose-response trend.

On balance, these analyses indicate that decreases in LH peak levels in this study are associated with high doses of both chemicals. The effects are strongest for DACT. The response of both LH surge measures to atrazine is present, but very weak.

Table 1.
Comparison of peak and triad LH levels in 8 chemical-dose treatment groups with the vehicle control.

Treatment Group	N	Peak LH Level			Peak Triad Mean		
		Mean	t*	Dunnett #	Mean	t*	Dunnett #
Control	35	4.10	–	–	2.68	–	–
Atrazine							
2.5	19	3.51	0.3767	0.9610	2.24	0.3449	0.9440
5	18	3.53	0.4029	0.9715	2.31	0.4312	0.9801
40	14	2.66	0.0549	0.3148	1.78	0.0864	0.4498
200	16	2.75	0.0592	0.3348	1.80	0.0790	0.4203
DACT							
2.5	20	3.00	0.0977	0.4928	1.92	0.1023	0.5095
5	19	3.30	0.2354	0.8329	2.13	0.2403	0.8402
40	18	2.77	0.0526	0.3038	1.65	0.0317	0.1977
200	13	1.00	<0.0001	0.0006	0.58	0.0001	0.0010

*Observed significance level (p-value) for a 2-sided pooled-variance t comparison of treatment to a control.
#Observed significance level (p-value) for a 2-sided Dunnett's test of treatment to a control.

Table 2.
Observed significance levels (p-values) for tests of dose-order trend.

Chemical	Peak LH	Peak Triad Mean LH
Atrazine	0.0327	0.0564
DACT	0.0002	0.0003

References

Brown, M. B. and Forsythe, A. B. 1974. Robust Tests for Equality of Variances. J. Amer. Stat. Assoc. 69:364-367.

SAS Institute. 2000. SAS/STAT User's Guide, Version 8. SAS Institute, Inc., Cary, NC.

Winer, B. J. 1962. Statistical Principles in Experimental Design. McGraw-Hill, NY.

Addendum 3 of Appendix E, Attachment 1

SAS Statistic Output Listing

Analysis of LH Surge in Female Rats 1

Listing of Data 11:14 Thursday, April 12, 2001

--------------------------- GroupName=00:Control ---------------------------

Animal	Pre	Peak	Post	TriMean
7083	0.08	4.72	4.18	2.99333
7084	1.05	1.59	0.07	0.90333
7085	4.00	7.41	1.99	4.46667
7086	3.97	6.10	4.66	4.91000
7087	0.78	3.66	1.69	2.04333
7088	2.41	4.54	0.15	2.36667
7089	0.09	4.48	4.20	2.92333
7090	2.67	4.51	2.05	3.07667
7091	1.41	1.85	0.86	1.37333
7092	6.44	9.51	4.98	6.97667
7093	0.41	4.68	2.49	2.52667
7094	3.05	6.27	4.09	4.47000
7095	2.09	12.08	5.58	6.58333
7096	1.74	2.86	5.48	3.36000
7097	1.58	3.51	0.53	1.87333
7098	0.61	5.03	4.91	3.51667
7099	0.31	1.47	1.13	0.97000
7100	1.05	2.97	2.22	2.08000
7101	2.40	3.43	2.16	2.66333
7103	2.09	2.31	0.08	1.49333
7107	0.08	0.17	0.10	0.11667
7108	0.59	1.52	0.15	0.75333
7109	1.20	2.16	0.14	1.16667
7110	0.05	5.26	3.17	2.82667
7111	1.15	2.31	0.78	1.41333
7112	4.74	7.57	4.37	5.56000
7113	3.89	4.68	1.83	3.46667
7114	4.95	7.05	1.81	4.60333
7115	0.93	1.35	0.03	0.77000
7116	0.31	1.38	0.42	0.70333
7117	1.04	5.74	4.44	3.74000
7118	1.31	2.78	0.88	1.65667
7120	1.81	2.79	1.08	1.89333
7121	0.50	2.28	2.15	1.64333
7122	0.58	3.61	1.79	1.99333

------------------------ GroupName=11:Atrazine(2.5) ------------------------

Animal	Pre	Peak	Post	TriMean
7283	0.08	5.54	4.37	3.33000
7284	0.60	2.82	1.77	1.73000
7285	1.03	1.47	0.09	0.86333
7286	0.72	1.82	0.80	1.11333
7287	0.60	2.88	1.69	1.72333
7288	0.04	1.05	0.67	0.58667
7289	0.52	1.83	1.54	1.29667
7290	0.06	0.59	0.58	0.41000

Analysis of LH Surge in Female Rats 2

Listing of Data 11:14 Thursday, April 12, 2001

------------------------- GroupName=11:Atrazine(2.5) -------------------------
(continued)

Animal	Pre	Peak	Post	TriMean
7291	0.81	2.83	1.85	1.83000
7293	3.61	6.63	5.16	5.13333
7294	1.64	2.82	1.62	2.02667
7295	2.47	3.43	0.76	2.22000
7296	1.52	2.02	0.04	1.19333
7297	3.11	5.49	1.90	3.50000
7298	1.49	2.00	0.98	1.49000
7299	4.20	6.09	0.74	3.67667
7300	4.12	6.30	0.14	3.52000
7301	4.34	9.62	3.59	5.85000
7302	1.02	1.42	0.61	1.01667

-------------------------- GroupName=12:Atrazine(5) --------------------------

Animal	Pre	Peak	Post	TriMean
7303	10.63	11.19	5.09	8.97000
7304	0.28	3.04	2.46	1.92667
7305	0.07	1.14	0.08	0.43000
7306	1.40	3.64	0.16	1.73333
7307	2.06	2.74	0.21	1.67000
7308	0.89	1.27	0.59	0.91667
7309	2.66	3.76	2.80	3.07333
7310	1.13	2.24	0.51	1.29333
7311	1.21	6.38	1.99	3.19333
7312	1.62	3.95	2.50	2.69000
7313	0.63	2.11	1.11	1.28333
7314	0.09	1.23	1.05	0.79000
7315	1.29	2.22	0.40	1.30333
7316	4.57	6.25	1.74	4.18667
7317	4.94	6.06	0.53	3.84333
7318	2.63	3.28	0.79	2.23333
7320	0.70	2.31	1.95	1.65333
7322	0.09	0.73	0.08	0.30000

------------------------- GroupName=13:Atrazine(40) -------------------------

Animal	Pre	Peak	Post	TriMean
7324	0.46	6.02	5.81	4.09667
7325	1.38	4.92	3.32	3.20667
7326	2.84	3.20	2.55	2.86333
7327	0.12	1.60	0.07	0.59667
7328	2.78	3.19	1.26	2.41000
7329	0.22	1.16	0.42	0.60000
7330	1.58	2.39	2.11	2.02667

------------------------- GroupName=13:Atrazine(40) -------------------------
(continued)

Animal	Pre	Peak	Post	TriMean
7334	1.31	4.47	3.68	3.15333
7335	0.38	0.69	0.08	0.38333
7336	1.54	3.47	1.02	2.01000
7337	1.30	1.36	0.62	1.09333
7339	0.38	1.48	0.20	0.68667
7340	0.74	3.17	1.30	1.73667
7342	0.07	0.14	0.09	0.10000

------------------------- GroupName=14:Atrazine(200) ------------------------

Animal	Pre	Peak	Post	TriMean
7343	4.25	7.77	4.34	5.45333
7344	0.07	1.63	1.04	0.91333
7345	0.26	0.44	0.17	0.29000
7346	1.40	2.75	0.08	1.41000
7347	2.17	2.33	1.71	2.07000
7348	0.31	2.20	0.69	1.06667
7350	0.10	1.85	1.69	1.21333
7351	0.23	0.83	0.86	0.64000
7352	7.43	7.94	2.72	6.03000
7353	0.44	1.95	0.75	1.04667
7354	0.09	1.21	0.44	0.58000
7355	0.08	1.48	0.07	0.54333
7356	0.09	1.13	0.40	0.54000
7357	3.51	6.76	2.50	4.25667
7359	1.43	2.12	1.05	1.53333
7360	0.63	1.63	1.53	1.26333

--------------------------- GroupName=21:DACT(2.5) --------------------------

Animal	Pre	Peak	Post	TriMean
7203	0.04	2.35	1.13	1.17333
7204	1.42	4.43	3.49	3.11333
7205	5.10	8.63	2.67	5.46667
7206	1.82	2.97	0.42	1.73667
7207	0.45	2.53	1.29	1.42333
7208	0.08	1.43	0.07	0.52667
7209	3.37	4.10	0.97	2.81333
7210	3.78	4.33	2.98	3.69667
7211	1.25	3.92	3.82	2.99667
7212	1.09	1.50	1.18	1.25667
7213	0.59	2.49	0.35	1.14333
7214	1.05	1.80	0.73	1.19333
7215	1.25	2.61	0.83	1.56333

--------------------------- GroupName=21:DACT(2.5) ---------------------------
(continued)

Animal	Pre	Peak	Post	TriMean
7216	2.99	3.78	0.88	2.55000
7217	1.04	2.73	0.11	1.29333
7218	1.11	1.12	0.35	0.86000
7219	2.31	3.99	0.64	2.31333
7220	1.30	3.06	2.44	2.26667
7221	0.72	1.41	0.07	0.73333
7222	0.09	0.87	0.08	0.34667

---------------------------- GroupName=22:DACT(5) ----------------------------

Animal	Pre	Peak	Post	TriMean
7203	10.36	15.38	7.29	11.0100
7204	5.56	6.64	1.22	4.4733
7205	0.11	3.17	2.06	1.7800
7206	0.04	6.72	6.64	4.4667
7207	1.98	2.46	1.12	1.8533
7208	1.36	2.28	1.34	1.6600
7209	0.08	1.66	0.08	0.6067
7210	0.15	0.93	0.08	0.3867
7211	0.76	2.19	0.40	1.1167
7212	0.09	1.15	0.09	0.4433
7213	2.27	4.41	2.21	2.9633
7214	0.93	2.19	0.75	1.2900
7216	1.58	2.85	1.01	1.8133
7217	0.08	0.64	0.07	0.2633
7218	0.57	1.11	0.35	0.6767
7219	1.46	3.26	0.40	1.7067
7220	1.99	2.54	0.88	1.8033
7221	1.50	2.94	1.53	1.9900
7222	0.11	0.24	0.08	0.1433

--------------------------- GroupName=23:DACT(40) ---------------------------

Animal	Pre	Peak	Post	TriMean
7243	0.07	2.83	1.61	1.50333
7244	3.24	4.29	1.18	2.90333
7245	1.74	3.38	2.36	2.49333
7246	1.26	2.51	0.86	1.54333
7247	0.59	1.71	1.06	1.12000
7249	0.73	1.82	0.08	0.87667
7250	0.07	0.26	0.09	0.14000
7251	1.13	1.92	0.64	1.23000
7252	0.40	1.08	0.95	0.81000
7254	0.51	0.78	0.36	0.55000

-------------------------- GroupName=23:DACT(40) --------------------------
(continued)

Animal	Pre	Peak	Post	TriMean
7255	5.47	5.81	1.25	4.17667
7256	0.04	0.90	0.88	0.60667
7257	0.65	2.26	0.07	0.99333
7258	1.56	7.13	0.51	3.06667
7259	3.01	6.62	0.92	3.51667
7260	0.34	2.24	0.13	0.90333
7261	0.89	1.43	0.23	0.85000
7262	1.38	2.85	2.84	2.35667

-------------------------- GroupName=24:DACT(200) -------------------------

Animal	Pre	Peak	Post	TriMean
7263	0.95	3.44	2.370	2.25333
7264	0.09	0.73	0.670	0.49667
7266	0.64	1.73	0.910	1.09333
7267	0.24	1.51	0.001	0.58367
7268	0.35	1.04	0.210	0.53333
7269	0.07	0.14	0.090	0.10000
7270	0.61	0.91	0.140	0.55333
7273	0.08	0.58	0.040	0.23333
7274	0.07	0.09	0.080	0.08000
7275	0.29	2.47	1.350	1.37000
7277	0.06	0.09	0.040	0.06333
7279	0.07	0.14	0.090	0.10000
7280	0.07	0.14	0.090	0.10000

Treatment Group Means and Standard Errors

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GroupName	Nr Animals	Mean Peak	SEPeak	Mean TriMean	SETri Mean
00:Control	35	4.10371	0.42619	2.68219	0.28400
11:Atrazine(2.5)	19	3.50789	0.55317	2.23737	0.35008
12:Atrazine(5)	18	3.53000	0.60661	2.30500	0.47137
13:Atrazine(40)	14	2.66143	0.45647	1.78310	0.33321
14:Atrazine(200)	16	2.75125	0.60787	1.80313	0.44896
21:DACT(2.5)	20	3.00250	0.38744	1.92333	0.27941
22:DACT(5)	19	3.30316	0.78232	2.12877	0.56921
23:DACT(40)	18	2.76778	0.46978	1.64667	0.27211
24:DACT(200)	13	1.00077	0.28914	0.58156	0.17949

Analysis of Treatment Differences in Peak LH Means

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The GLM Procedure

Class Level Information

Class	Levels	Values
GroupName	9	00:Control 11:Atrazine(2.5) 12:Atrazine(5) 13:Atrazine(40) 14:Atrazine(200) 21:DACT(2.5) 22:DACT(5) 23:DACT(40) 24:DACT(200)

Number of observations 172

Analysis of LH Surge in Female Rats 8

Analysis of Treatment Differences in Peak LH Means

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The GLM Procedure

Dependent Variable: Peak

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	106.307199	13.288400	2.39	0.0185
Error	163	906.936268	5.564026		
Corrected Total	171	1013.243467			

R-Square	Coeff Var	Root MSE	Peak Mean
0.104918	75.02993	2.358819	3.143837

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GroupName	8	106.3071991	13.2883999	2.39	0.0185

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Analysis of Treatment Differences in Peak LH Means

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The GLM Procedure

Brown and Forsythe's Test for Homogeneity of Peak Variance
ANOVA of Absolute Deviations from Group Medians

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
GroupName	8	19.2649	2.4081	0.75	0.6457
Error	163	522.1	3.2033		

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Analysis of Treatment Differences in Peak LH Means

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The GLM Procedure

Level of GroupName	N	Peak Mean	Peak Std Dev
00:Control	35	4.10371429	2.52137577
11:Atrazine(2.5)	19	3.50789474	2.41122970
12:Atrazine(5)	18	3.53000000	2.57362413
13:Atrazine(40)	14	2.66142857	1.70794909
14:Atrazine(200)	16	2.75125000	2.43149577
21:DACT(2.5)	20	3.00250000	1.73270058
22:DACT(5)	19	3.30315789	3.41005874
23:DACT(40)	18	2.76777778	1.99310740
24:DACT(200)	13	1.00076923	1.04249270

Analysis of Treatment Differences in Peak LH Means

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The GLM Procedure
Least Squares Means

GroupName	Peak LSMEAN	H0:LSMean= Control Pr > |t|
00:Control	4.10371429	
11:Atrazine(2.5)	3.50789474	0.3767
12:Atrazine(5)	3.53000000	0.4029
13:Atrazine(40)	2.66142857	0.0549
14:Atrazine(200)	2.75125000	0.0592
21:DACT(2.5)	3.00250000	0.0977
22:DACT(5)	3.30315789	0.2354
23:DACT(40)	2.76777778	0.0526
24:DACT(200)	1.00076923	<.0001

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

Analysis of Treatment Differences in Peak LH Means

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The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Dunnett

GroupName	Peak LSMEAN	H0:LSMean= Control Pr > |t|
00:Control	4.10371429	
11:Atrazine(2.5)	3.50789474	0.9610
12:Atrazine(5)	3.53000000	0.9715
13:Atrazine(40)	2.66142857	0.3148
14:Atrazine(200)	2.75125000	0.3348
21:DACT(2.5)	3.00250000	0.4928
22:DACT(5)	3.30315789	0.8329
23:DACT(40)	2.76777778	0.3038
24:DACT(200)	1.00076923	0.0006

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Analysis of Treatment Differences in Peak LH Means

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The GLM Procedure

Dependent Variable: Peak

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
Atr Trend	1	25.82678689	25.82678689	4.64	0.0327
DACT Trend	1	78.63288515	78.63288515	14.13	0.0002

Analysis of LH Surge in Female Rats 14

Analysis of Treatment Differences in Peak Triad LH Means

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The GLM Procedure

Class Level Information

Class	Levels	Values
GroupName	9	00:Control 11:Atrazine(2.5) 12:Atrazine(5) 13:Atrazine(40) 14:Atrazine(200) 21:DACT(2.5) 22:DACT(5) 23:DACT(40) 24:DACT(200)

Number of observations 172

Analysis of Treatment Differences in Peak Triad LH Means

The GLM Procedure

Dependent Variable: TriMean

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	49.0634270	6.1329284	2.26	0.0258
Error	163	442.6213464	2.7154684		
Corrected Total	171	491.6847734			

R-Square	Coeff Var	Root MSE	TriMean Mean
0.099786	81.49232	1.647868	2.022114

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GroupName	8	49.06342699	6.13292837	2.26	0.0258

The GLM Procedure

Brown and Forsythe's Test for Homogeneity of TriMean Variance
ANOVA of Absolute Deviations from Group Medians

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
GroupName	8	10.1340	1.2667	0.79	0.6128
Error	163	261.6	1.6049		

Analysis of Treatment Differences in Peak Triad LH Means

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The GLM Procedure

Level of GroupName	N	TriMean Mean	TriMean Std Dev
00:Control	35	2.68219048	1.68016280
11:Atrazine(2.5)	19	2.23736842	1.52595956
12:Atrazine(5)	18	2.30500000	1.99983798
13:Atrazine(40)	14	1.78309524	1.24674994
14:Atrazine(200)	16	1.80312500	1.79583735
21:DACT(2.5)	20	1.92333333	1.24954261
22:DACT(5)	19	2.12877193	2.48110967
23:DACT(40)	18	1.64666667	1.15447637
24:DACT(200)	13	0.58156410	0.64716000

Analysis of Treatment Differences in Peak Triad LH Means

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The GLM Procedure
Least Squares Means

GroupName	TriMean LSMEAN	H0:LSMean=Control Pr > |t|
00:Control	2.68219048	
11:Atrazine(2.5)	2.23736842	0.3449
12:Atrazine(5)	2.30500000	0.4312
13:Atrazine(40)	1.78309524	0.0864
14:Atrazine(200)	1.80312500	0.0790
21:DACT(2.5)	1.92333333	0.1023
22:DACT(5)	2.12877193	0.2403
23:DACT(40)	1.64666667	0.0317
24:DACT(200)	0.58156410	0.0001

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

Analysis of Treatment Differences in Peak Triad LH Means

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Dunnett

GroupName	TriMean LSMEAN	H0:LSMean=Control Pr > |t|
00:Control	2.68219048	
11:Atrazine(2.5)	2.23736842	0.9440
12:Atrazine(5)	2.30500000	0.9801
13:Atrazine(40)	1.78309524	0.4498
14:Atrazine(200)	1.80312500	0.4203
21:DACT(2.5)	1.92333333	0.5095
22:DACT(5)	2.12877193	0.8402
23:DACT(40)	1.64666667	0.1977
24:DACT(200)	0.58156410	0.0010

Analysis of Treatment Differences in Peak Triad LH Means

11:14 Thursday, April 12, 2001

The GLM Procedure

Dependent Variable: TriMean

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
Atr Trend	1	10.02308489	10.02308489	3.69	0.0564
DACT Trend	1	38.01039997	38.01039997	14.00	0.0003

Attachment 2

Syngenta's Comments on Use/Usage and Labeling Noted in the EPA's January 19, 2001, "Atrazine: HED's Revised Preliminary Human Health Risk Assessment (and Associated EPA Documents) for the Reregistration Eligibility Decision (RED)

Summary

This section contains comments on usage and labeling information provided as background in the identified subject documents. Details are presented below.

Revised Preliminary Human Health Risk Assessment

Detailed Comments:

1. Page 5, 6th Bullet Point; and Page 6: "Further reduction of the application rates for corn and sorghum to 2.5 lbs. a.i./acre/ year" should be qualified to note that this is a total of a maximum post-emergence application at 2.0 lb a.i./A following a 0.5 lb a.i./A pre-emergence application or any combination of pre- and post- rates not exceeding 2.5 lbs.

2. Page 25, Data Gaps, Line 10: "additional exposure and use data for mixing, loading, and application of dry and liquid fertilizers, both commercially (including cooperatives) and on-farm…" Dry fertilizer impregnation of atrazine is not possible on-farm, so such data should not be requested. Automated large-scale blenders which use machinery that limits exposures are used to prepare these fertilizer/atrazine preparations. In addition, the assumption that 960 tons of fertilizer is mixed and loaded within a day is not correct. Using information from major fertilizer manufacturers, an upper bound estimate for impregnating dry bulk fertilizer with atrazine would be 200 tons of fertilizer per day. Syngenta is submitting a document (Appendix 1, Attachment 4) that more fully describes the treatment process, possible exposure scenarios, and risk calculations.

3. Page 46: We note the mention in the revised risk assessment of a product, Oxon Italia 5L, for use on roadsides; please note that this product has uses not supported by Syngenta. The use rate for this formulation is equivalent to 1.25 lb a.i./A**,** which is higher than any other atrazine products labeled by Syngenta for the roadside use. Syngenta also notes here that the 5L label rate of 3.0 lb a.i./A on corn and sorghum is not supported by the atrazine technical label and the residue field trial data used to reassess the tolerances for corn and sorghum.

Product and Residue Chemistry Chapters

1. Page 63, Table C: Syngenta is not supporting perennial rye grass use patterns and we are not aware of any other registrants supporting these uses. They should be deleted as tolerance requirements.

Occupational and Residential Exposure Assessment

1. Page 1, 1st Paragraph: The use of atrazine on sod and turf is more correctly described as southern turfgrass.

2. Page 4, Last Paragraph: It is incorrect to list certain of these uses as high rates. For instance, chemical fallow rates should not exceed 3 lb a.i./A and CRP rangeland use rates should not exceed 2 lb a.i./A, so it is not appropriate to characterize these uses as a high atrazine rates, nor “largest quantities” on minor use crops like forestry, chemical fallow programs and CRP land. Additionally, grasslands is not an accurate description of the use pattern for CRP rangeland, since the labeled use is limited to four states, OK, NE, OR, and TX, and grazing or cutting and feeding of hay on CRP acres are not permitted, except for severe drought conditions. If atrazine was used, grazing and making of hay are restricted on the label. If other registrants have products with a similar use pattern but higher rates, again, they are not supported by adequate residue data and therefore, should not be used in the assessment.

3. Page 5, 3rd Paragraph: Under the heading “Post-application Worker Exposure and Risk Estimates”, the sentence reads “The lowest MOEs for trimming /harvesting Christmas trees (120) and harvesting sod (100), used …..exposure estimate.” Please note that atrazine treatment is seldom or never followed by trimming/harvesting of trees, since atrazine is applied in spring and trees are harvested in the winter. Staking of trees, which could present another exposure scenario, is never done and Syngenta is providing information from specialists in the industry on this practice**.** Also, sod removal or harvesting is restricted for 30 days following application.

4. Page 7, 4th Paragraph: Dry fertilizer impregnation of atrazine is not possible on-farm and must be conducted in a facility where proper equipment is present. Automated large-scale blenders that limit exposures do these preparations. Syngenta is submitting with this response a document that will more fully describe the treatment process, possible exposure scenarios, and risk calculations.

5. Page 36: In the section headed by “Baseline” at the bottom of the page, it notes the use rate on bermudagrass rights-of-way is 4 lb a.i./A. Syngenta Special Local Need (SLN) labels only allow 2 lb a.i./A. If there are other registrants who have higher rates, we are not aware of them. Also, “grasslands” is not the same as CRP rangeland, for reasons stated elsewhere in these comments.

6. Page 44, 4th Paragraph: Concerning the statement , “The lowest MOEs, for trimming/harvesting Christmas trees and harvesting sod ……conservative exposure estimate”, Syngenta refers to response 3 above regarding the timing of atrazine application relative to these tasks.

7. Page 80, Table 5: Table 5 indicates a bermudagrass right-of-way rate of 4 lb a.i./A, but this is not consistent with Syngenta’s SLN labels that list a maximum of 2 lb a.i./A.

Anticipated Residues and Acute and Chronic Dietary Exposure Assessments for Atrazine

1. Page 6: BEAD has revised the original overestimate of percent crop treated (PCT) for atrazine on corn and now states that, on average, 75% of the crop was treated, and at a maximum, 84% of the crop could be treated. As stated earlier in our comments, USDA NASS data for 1997– 1999 shows ~70% of corn acres receives atrazine. Syngenta has been tracking the PCT for several years and it is at ~ 70%. The Syngenta 2001 Chronic Dietary Assessment contains the most recent Doane survey results for corn and sorghum.

2. Page 20, Table 6: In Table 6, the assumption of 100% of the sugarcane crop being treated is not realistic. The Syngenta 2001 Chronic Dietary Assessment provides updated information on sugarcane use which indicates that the PCT is 70%.

3. Page 53, Attachment 7: The use site "Woodlands" is noted. This is not a Syngenta registered use and is not supported by Syngenta for registration.

4. Page 55, Attachment 7: In the footnotes to the table, the Agency should provide details on the weighting rationale and formulas so the process used is transparent to stakeholders.

Attachment 3

Syngenta's Comments on EPA's January 18, 2001 "Atrazine: HED Product and Residue Chemistry Chapters" (Including the Tolerance Reassessment Summary) and "Atrazine: Anticipated Residues and Acute and Chronic Dietary Exposure Assessments for Atrazine. Revised January 2001"

<u>Response to the Residue Chemistry Chapters Including the Tolerance Reassessment</u>

Typographical Error:

1. Page 35, 1st Paragraph: Bicep is no longer sold and has been replaced with Bicep II MAGNUM. Bicep II MAGNUM is not registered on guava, macadamia nuts, sugarcane, range grasses, or fallow.

2. Page 36, 1st Paragraph, line 7: "G27283" should be G-28273.

3. Page 37, 3rd Paragraph: Please provide the rates used for applications to pasture grass specifically for the 90DF and the 5L formulations.

4. Page 38 and 39: The "#" sign used repeatedly before %TRR should be replaced with"~".

5. Page 41, 3rd Paragraph, last line: "combined residues of – 0.1 ppm" should read "combined residues of ~ 0.1 ppm".

6. Page 45, 3rd Paragraph, line 2: Delete the word "which" after wheat hay.

7. Page 46, line 2: Replace "#" with "~".

8. Page 46, Paragraph 5: Several typos need to be corrected.

<u>Comments with Regard to Content and Conclusions of the Residue Chemistry Chapter:</u>

1. Page 41, 1st Paragraph, Line 6: "… "AG-484 (previously submitted as MRID 40431365)…" should be deleted. This part of the paragraph is referring to the hydroxy-triazine method; AG-484 is the chloro-triazine method.

2. Page 41, 1st Paragraph, Last Sentence: The Agency is requesting an analytical method for all four hydroxy-atrazine metabolites. Based on metabolism study results in corn, sorghum and sugarcane, desethylhydroxy- atrazine (GS-17794) is suitable as a marker residue. Syngenta is presenting scientific justification (Appendix 2 to this Attachment) for the utilization of GS-17794 as a marker residue for the hydroxy-triazine metabolites.

3. Page 41, 2nd Paragraph, Last Sentence: Delete " The registrant must… for PMV testing." and add the statement "Method 484 (MRID 40431365) has previously been submitted to the Agency and should be forwarded to ACB for PMV testing."

4. Page 45: Syngenta agrees with the EPA calculation of chloro-triazine and hydroxy-triazine tolerances for wheat hay based on existing residue data for wheat forage.

5. Page 46, 5th Paragraph: In the case of sugarcane processing, the Agency has concluded that the submitted processing study (MRID 43160504) was inadequate because only a 2X exaggerated rate (20 lb a.i./A) was applied. While a 5X (50 lb a.i./A) rate would normally be required, the label for both the AAtrex 4L and Nine-O products clearly indicate that applications in excess of 10 lb a.i./A may result in crop injury. A 50 lb a.i./A treatment rate will almost certainly result in crop injury and compromise the study.

6. Page 53, Last Paragraph, Rotational Crops: Limited field trials will be conducted on the Foliage of Legume Vegetables Crop Group to set tolerances after the Agency reviews a draft protocol, since the requested study for limited trials in a single crop group is not a guideline study.

   According to OPPTS 860.1900 Paragraph 2(vi), if residues are found in field studies utilizing indicator rotational crops, "rotational crop tolerances will be required". According to the guideline, the number of trials to be conducted to set an inadvertent residue tolerance in the Foliage of Legume Vegetables Crop Group is the same as for a target crop tolerance (21 trials). This does not appear to be a "limited" field trial study. Because of the complexity and expense of such a study, Syngenta would like to provide the Agency with a draft study protocol to assure that the type, number, and location of the rotational crop field trials are sufficient to satisfy this requirement.

<u>Comments with Regard to the Tolerance Reassessment Summary</u>

GENERAL: Accompanying this 60-Day Response, Syngenta is providing residue summaries (Attachment 7) for corn and sorghum that support different tolerances for parent and the chloro-metabolites of atrazine in certain corn and sorghum substrates than those proposed by EPA in the Tolerance Reassessment Summary. In addition two tables which document and contrast the current residue profile for atrazine in corn and sorghum based on the most recent field trial data with the residues found in previous field trials are found in Appendix 1 of this attachment. In the document "Atrazine Residue Summary – Corn", the report number, the number of distinct field corn and sweet corn trials, the type of application, and a comments section are provided. Fourteen reports provide data on a total of 118 field corn trials and 40 sweet corn trials to aid in the evaluation of appropriate PHI changes and tolerance adjustments (reductions). A similar table which summarizes nine reports and 57 field trials is provided for sorghum. The total chloro-triazine residues found in the corn and sorghum forage samples in the historical field trial database were all below the 1.5 ppm tolerance being proposed by Syngenta, except for a few samples which all derived from trials with higher rates and/or shorter PHIs than those now proposed. A brief retrospective on atrazine analytical methods development is also included with the residue trial Summary Tables.

7. Page 62, Table C. Milk: The Agency has proposed a reassessed tolerance in milk of 0.10 ppm. The previous milk tolerance was set at 0.02 ppm based on parent atrazine only. The dairy cattle diet used by the Agency in calculating maximum possible milk residues included sweet corn forage. Because of the large proportion of forage fed (50%) and the EPA reassessed tolerance of 4.0 ppm, sweet corn forage contributes almost all of the total atrazine residues in the dairy cattle diet. Syngenta is submitting with this response field trial residue summaries which support tolerances for both field and sweet corn forage at 1.5 ppm. Substituting 1.5 ppm for 4.0 ppm in the dairy diet lowers the maximum theoretical dietary burden (MTDB) to 2.0 ppm.

   In the three level feeding study used by EPA to estimate the transfer of atrazine residues to milk, no residues of parent, desethyl, or desisopropyl metabolites were detected at the lowest feeding level (3.75 ppm). Diaminochloro-triazine (DACT) was detected at all three feeding levels and the residues found demonstrated a linear dose response. Assuming linearity of the dose response for parent and the other two metabolites, the residues of the desethyl or desisopropyl metabolites found at the highest feeding level (37.5 ppm) in milk can be extrapolated to the 3.75 ppm level and added to the DACT residues. Hence maximum residues of atrazine, G-30033, and G-28279 occurring in milk at the 37.5 ppm feeding level (<0.01 ppm, 0.03 ppm, 0.02 ppm, respectively) can be extrapolated to <0.001 ppm, 0.003 ppm, and 0.002 ppm at the 3.75 ppm feeding level. The extrapolated residues added to the DACT residue found at 3.75 ppm yields a combined total chloro-triazine value of <0.036 ppm in milk. Multiplying 0.036 by the ratio of the newly proposed MTDB and the dairy feeding level (2.0 ppm/3.75 ppm) would result in a milk residue of <0.019 ppm.

   The use of residue extrapolation is scientifically valid and commonly used for crop tolerance evaluations where exaggerated rates have been tested in field trials, and some degree of linearity can be established in the dose response. Use of this methodology should not be in question for derivation of meat and milk tolerances.

   Metabolism and residue data and methodology submitted by Syngenta also support the conclusion that the tolerance should remain at 0.02 ppm. The analytical Lower Limit of Method Validation (LLMV) of Analytical Method AG-496A is 0.01 ppm per each chloro-triazine analyte, so the method sensitivity is such that the tolerance based on non-detectable residues of the four chloro metabolites (<0.005 ppm each) is enforceable. There were no detectable residues in USDA's Pesticide Data Program (PDP) database at an average Limit of Detection (LOD) of 0.0075 ppb. In addition, the Agency used a value of 0.0005 ppm for milk in their dietary exposure assessment based on theoretical dietary burden calculations. Based on the Agency's dietary burden calculations and the results from a recently submitted 3-level feeding study in lactating cattle which was conducted to determine the transfer of ^{14}C-atrazine residues to milk (MRID 43934412), an estimated total triazine residue level of less than 1 ppb would occur in milk. Thus, the current tolerance value of 0.02 ppm should be more than adequate for milk.

Syngenta understands that the tolerance is the upper bound legal limit of residues in milk; however, the Agency is proposing a 5-fold increase in the current tolerance based on an analysis which is extremely conservative using a sweet corn forage tolerance of 4.0 ppm. Syngenta is supplying residue data which supports a tolerance of 1.5 ppm in sweet corn forage.

Comments with Regard to Content and Conclusions of the Exposure Assessments:

Chronic Dietary Exposure Assessment: Comparison of EPA's 2001 Refined Chronic Dietary Assessment and Syngenta's 2001 Chronic Dietary Assessment for Atrazine and the Chloro-Triazines

A review of the Agency's revised 2001 chronic dietary assessment and the 2001 Syngenta chronic dietary assessment for atrazine (Attachment 11) and corresponding chloro-triazines shows that chronic dietary exposure to the chloro-triazine residue subset is negligible in all analyses. A comparison of chloro-triazine exposures for the U.S. population, infants (<1 year old) and children (1-6 years old) demonstrates that chronic exposure ranges from 0.018-0.002 µg/kg-bw/day depending on the sensitivity analysis performed for the various corn and sorghum usage parameters. Syngenta performed sensitivity analyses that included incremental usage information for corn and sorghum, as well as combining the metabolites of simazine that are common to atrazine to account for the simultaneous consumption of atrazine and simazine-treated commodities. The Syngenta and Agency dietary assessments contained pre-, post- and split-application weighted calculations for corn and sorghum residues incorporating percent of each usage on a national basis, as well as percent of crop treated (base acres) adjustments. The corn and sorghum percent crop treated values and percent of application usage in the EPA's revised chronic assessment were similar albeit not the same as the values used in the 2001 Syngenta assessment.

The Agency's revised assessment used corn and sorghum field trial data generated from samples taken 60 days after pre-emergence application, 30-days after post-emergence application, and 30 days after the maximum split-rate application. Syngenta proposes that future labels be amended to reflect longer pre-harvest intervals (PHIs) for corn and sorghum forage. For sorghum forage, the label revision reflects a change from a 45-day pre-emergence PHI to a 60-day PHI. (Field corn and sweet corn will retain the current 60-day and 45-day PHIs, respectively.) For post-emergence treatment on field and sweet corn and sorghum forage, the label amendment includes a change from a 30-day PHI to 60 days for field corn forage and 45 days for sweet corn and sorghum forage. Since Syngenta has included in this submission supporting data for corn and sorghum forage tolerance revisions, the Syngenta exposure values used to compare with EPA's revised assessment were calculated from corn and sorghum forage data generated from the longer proposed pre-harvest intervals.

The most direct comparison between the Agency's exposure values and the Syngenta-derived values can be made with the Syngenta assessment for parent atrazine and combined chloro-triazines (without the adjustment for incremental use rate or the inclusion of simazine metabolites). Since both Syngenta and Agency assessments utilized residue refinements associated with application regime, the major differences in the exposure values are due to the length of the PHI and associated impact on the magnitude of corn and sorghum forage residues.

Comparison of Atrazine and Chloro-Triazine Exposures Obtained from EPA's 2001 Revised Chronic Dietary Assessment vs. Syngenta's 2001 Chronic Dietary Assessment:

Population Subgroup	**ATZ w/out Incremental Rate Adjustment (µg/kg-bw/day)**	ATZ with Incremental Rate Adjustment (µg/kg-bw/day)	ATZ plus SIM w/out Incremental Rate Adjustment (µg/kg-bw/day)	ATZ plus SIM with Incremental Rate Adjustment (µg/kg-bw/day)	**EPA 2001 Revised Dietary Exposure Assessment (µg/kg-bw/day)**
U.S. Population	**0.003**	0.002	0.006	0.005	**0.005**
Infants (<1 year)	**0.006**	0.005	0.009	0.008	**0.008**
Children (1-6 years)	**0.010**	0.008	0.018	0.016	**0.017**

Note: Bolded numbers represent the most direct comparison between the Agency 2001 assessment and the Syngenta 2001 dietary assessment.

In Syngenta's 2001 assessment, the corn and sorghum forage residue data generated from the proposed minimum PHIs provided for a reduction in the theoretical dietary burden in the livestock diet constructs and associated reduction in meat and milk residue levels as compared to the 2001 Agency assessment. Additional differences between Syngenta's 2001 assessment and EPA's revised 2001 assessment include the parameters of the livestock diet construct and feed to milk and meat transfer factors. In the Syngenta 2001 assessment, a dairy cattle diet was constructed to calculate a dietary burden which was used with transfer factors from ^{14}C-metabolism studies for prediction of residue estimates in milk, meats, and fat. The dairy cattle diet used in the 2001 Syngenta assessment is the same as the previously submitted 1997 dietary assessment (MRID 44315407). Accompanying the 1997 dietary assessment was a separate report (MRID 44315413) outlining the rationale used in the construction of the dairy cattle diet. This cattle diet was constructed with guidance from Dr. Jim Spain of the Animal Sciences Center at the University of Missouri and contains the proper nutrients to sustain milk production in dairy cattle. A comparison between the dietary burdens and associated residues in livestock commodities by the Agency in their assessment and the values used in the Syngenta assessment are provided below. The comparison is made for the Syngenta assessment containing atrazine and chloro-triazines without the adjustment for incremental usage on corn and sorghum (and without the inclusion of the common metabolites of simazine) since this assessment more closely correlates with the Agency's assessment for the chloro-triazines.

Comparison of Livestock Dietary Burden and Secondary Residues in Animal Commodities for the Atrazine and Chloro Triazines in the Syngenta 2001 Chronic Dietary Assessment and the Revised 2001 Agency Chronic Dietary Assessment		
	EPA's 2001 Revised Dietary Assessment (ppm)	Syngenta 2001 Dietary Assessment (ppm)
Dietary Burden		
Beef Cattle Diet	0.036	Not Applicable
Dairy Cattle Diet	0.043	0.0277
Secondary Livestock Residues		
Milk	0.0005	0.0003
Meat	0.0003	0.00009
Fat	0.0002	0.00001
Liver	0.0002	0.00007
Kidney	0.0003	0.00005

In the Agency's 2001 assessment, the transfer from feed to milk and tissues was based on a 3-level residue feeding study in dairy cattle (MRID 40431424). The transfer from feed to tissues and milk was made by taking the ratio of the lowest feeding level in the 3-level dairy study (3.75 ppm) to the calculated dietary burden obtained in the Agency's beef and dairy cattle diet constructs. The ratio calculated using the 3.75 ppm feeding level to the dairy dietary burden was then used to adjust the average chloro-triazine residue obtained in milk at the 3.75 ppm feeding level to obtain the anticipated residue in milk. Similarly, the ratio of the 3.75 ppm feeding level to the beef cattle dietary burden was used to adjust the meat and fat residues obtained at the 3.75 ppm level in the dairy cattle feeding study to obtain the anticipated chloro-triazine residues in meat and fat. In contrast, Syngenta used transfer information for feed to milk from a ^{14}C-metabolism study in lactating goats (MRID 43934412) designed to evaluate the nature of the residue and residue transfer into milk. Transfer information for tissues was obtained from the same 3-level dairy feeding study the Agency used except that a least square linear regression plot was made using all of the combined residue data points at all feeding levels for each substrate and extrapolating linearly through the origin. For non-detected residues, a value of 0.01 ppm (lower limit of method validation) was assigned and combined for a total chloro-triazine value. The slope of the extrapolation for each substrate was used with the dairy cattle dietary burden to predict the anticipated chloro-triazine residues in organs, meat and fat.

A further refinement for parent atrazine and associated chloro-triazines was made in the Syngenta 2001 assessment using information on the percent of base acres receiving incremental use rates. The percent of base acres (acres treated at least once with a post-emergence application of atrazine) was delineated by 0.1 lb – 0.25 lb rate increments (Doane, 1999). Base acres treated in excess of the post-application maximum of 2.0 lb a.i./A were included in the highest rate increment of 1.76 – 2.0 lb a.i./A. Adjusting the corn and sorghum residues by the incremental rate adjustment afforded a twenty to thirty percent reduction in exposure for the

U.S. population, children (1-6 years) and infants as compared to the Syngenta assessment conducted without the incremental use rate adjustment. In comparison, the incremental use rate adjustment provided an exposure reduction of fifty percent for the U.S. population ranging to a reduction of twenty five percent for infants (<1 year old) when compared to EPA's exposure estimate.

In order to account for the simultaneous consumption of atrazine- and simazine-treated commodities, a sensitivity analysis was performed to include in the dietary assessment the metabolites of simazine that are common to atrazine for all simazine-treated commodities. The two crops that are treated with both simazine and atrazine are corn and macadamia nuts. For corn, the percent of crop treated with both simazine and atrazine was factored into the assessment in addition to the percent of crop treated with atrazine only or simazine only. Since the number of treated base acres is extremely small, the residue value for macadamia nuts was not adjusted for both simazine and atrazine usage (the percent crop treated value for atrazine was utilized). For all other crops treated with simazine (small fruits and berries, citrus, stone and pome fruit, avocados, olives and tree nuts), residue levels of the metabolites of simazine that are common to atrazine were included in the analysis. The cumulative assessment was further refined by adjusting the corn residue contribution from atrazine with the incremental use rate adjustment. Even with the addition of the simazine-treated crops and associated residue levels of the common metabolites of simazine, exposures for the U.S. population and sensitive subpopulations were negligible.

8. Page 6, 1st Paragraph: The 70:30 pre- and post-emergence ratio was correctly derived from the 1997 survey data. However, more recent survey data (1998 and 1999) indicates that this ratio can change slightly. Syngenta is submitting, along with this response, an updated dietary exposure assessment for atrazine and the common metabolites of simazine, which will provide a more accurate estimate of these ratios (Attachment II).

9. Page 6, 2nd Paragraph: It is unclear how BEAD calculated "average" and "maximum" percent of crop treated and the values obtained for corn. Syngenta will work with BEAD via the ACPA sponsored Dietary Assessment Work Group to contribute to the development of updated methods for performing these calculations. Both the average corn PCT of 75% and the maximum corn PCT of 84% proposed by the Agency and used throughout the dietary assessment are higher estimates than any of the information available to Syngenta would indicate.

10. Page 11, Wheat: Atrazine use in wheat fallow programs is limited to application on fallow ground with wheat being planted at least a year later. Based on the use pattern and studies conducted with ^{14}C-atrazine, no parent atrazine residues would be anticipated as a result of the label use.

11. Page 11, 2nd Paragraph: The Agency states that "No metabolism study had been performed on wheat…". However, Syngenta submitted a metabolism study in which wheat was grown as a rotational crop following corn and sorghum (MRID 43016505).

12. Page 51: The phrase "winter wheat that is" should be changed to "after wheat harvest".

Appendix 1 of Attachment 3

Corn and Sorghum - Methodology and Residue Profiles

Chloro-Triazine Methodology - Corn

Original tolerances for atrazine residues in corn were granted based on methodology that extracted residues with chloroform, cleaned the extracts using retention on activated alumina with selective elution, hydrolyzed the eluant with acid, and determined the residues via UV absorption. Atrazine has a UV maximum at 215 nm. By hydrolyzing with acid to form the corresponding hydroxy-atrazine, the UV maximum is shifted to 240 nm, which is a more desirable wavelength to make an analytical determination (solvent and plant co-extractive interferences are minimized). The limit of quantitation for this method in controlled experiments was 0.04 ppm (untreated controls and procedural recoveries were run with each analytical set). Because government laboratories do not use untreated checks or controls and do not run recoveries with each analytical set, the original method evaluation by FDA/USDA laboratories determined that the limit of detection/quantitation was 0.25 ppm. Using this methodology, tolerances of 0.25 ppm in field corn grain and for sweet corn ears (kernels plus cobs, husks removed) were granted. A forage and stover (fodder) tolerance of 15 ppm was also issued for field and sweet corn. It is believed that the 15 ppm was based more on analytical methodology than actual detects requiring such a tolerance.

Subsequent methodology utilized the same extraction and alumina cleanup. Determination was by gas chromatography using microcoulometric detection. Specificity was achieved via the alumina chromatography, the gas chromatographic separation, plus the chloride specificity of the microcoulometric detector. The limit of quantitation was 0.05 ppm. This methodology was also submitted for tolerance enforcement purposes.

The quantitation of atrazine chloro-metabolites was addressed in the early 1970's by evaluating their elution profile through the alumina clean-up column and gas chromatographic columns. The monodealkylated chloro-*s*-triazine metabolites G-28279 and G-30033 could be determined with the existing methodology. The di-dealkylated G-28273 required a separate extraction and cleanup. The chromatography of this metabolite was more difficult and original methodology determination limits were 0.10 ppm. An aqueous acetonitrile or aqueous methanol reflux extraction was employed to remove chloro-triazine residues (including G-28273) from crop substrates.

The atrazine and chloro-triazine metabolite analyses were further enhanced through the use of capillary gas chromatographic columns and the nitrogen-enhanced response of the N/P detector.

The most recent methodology employs an aqueous methanol reflux extraction. The organic solvent is removed and the aqueous adsorbed onto an Extralut column. Atrazine and the dealkylated chloro-metabolites can be removed using hexane/ethyl acetate eluants. Optional alumina Sep-Paks for atrazine, G-28279, and G-30033 and Florisil Sep-Pak for the G-28273 can be employed to improve gas chomatographic determination. The limit of determination of each analyte is 0.05 ppm.

A modification of the above method, using C-18 and anion exchange cleanups prior to the Extralut clean-up allows for a lowering of the limit of determination to 0.005 ppm (5 ppb).

A survey of available documents generated by Ciba-Geigy Corporation/Novartis Crop Protection/Syngenta Crop Protection yielded twenty-three reports generated for submittal or data recording purposes for atrazine issued since 1973 that provide data on combined atrazine and dealkylated chloro-triazine metabolites in corn. The reports are summarized the following table, “Chloro-Triazine Residue Summary – Corn”.

Chloro-Triazine Residue Summary – Corn

Report Number	No. of Trials		Type of Application	Comments
	Field Corn	Sweet Corn		
GAAC-73064	3	1	Postemergence	All rates exceed current label. Highest residues at 4.0 lb + oil rate. Maximum chloro-triazine residues in field corn 28-67 days was 1.8 ppm. Maximum residues in sweet corn (treated at 24"-30") was 1.5 ppm at 36-day PHI.
GAAC-75080	7	3	Pre, PPI w/wo fertilizer	No detects (<0.25 ppm) in 59-67 day forage @ 1.0 lb ai/A.
GAAC-75081	8	1	Pre, PPI tank mix or prepack	No detectable residues (<0.25 ppm) in 48-day forage @ 1.6, 2.0 lb ai/A
GAAC-76069	-	-	Pre, PPI tank mix or prepack	Field Corn Grain and Sweet Corn Ears (Not applicable to forage/stover input in dairy animal/beef cattle diet)
GAAC-77017	-	-	Pre, PPI tank mix w/wo fertilizer	Field Corn Grain (Not applicable to forage/stover input in dairy animal/beef cattle diet)
GAAC-77028	-	-	Pre, PPI prepack w/wo fertilizer	Field Corn Grain (Not applicable to forage/stover input in dairy animal/beef cattle diet)
GAAC-77074	-	-	Pre 3-way tank mix	Field Corn Grain (Not applicable to forage/stover input in dairy animal/beef cattle diet)
GAAC-78022	-	-	Pre, PPI tank mix	Field Corn Grain (Not applicable to forage/stover input in dairy animal/beef cattle diet)
GAAC-78028	8	4	Pre, PPI tank mix or prepack w/wo fertilizer	Highest residue in 60-70 day forage/fodder was 0.18 ppm @ 2.0 lb ai/A
ABR-78074	6	-	Tank mix or prepack through irrigation	Highest forage residue 75-150 days was 0.39 ppm @ 2.0 lb ai/A
ABR-79019	8	-	Pre Tank mix w/wo fertilizer	No detects 75-179 day forage/fodder @ 2.0 lb ai/A
ABR-79038	6	6	Early Post tank mix or prepack	No detectable residues in 42-day forage @ 2.0 lb ai/A
ABR-79105	-	-	-	Simazine document, some reference to atrazine. No new atrazine data.
ABR-82031	8	2	Pre/PPI + Layby or Layby	Highest combined chloro-triazine residue in 37-day forage was 0.26 ppm @ 2.0 lb ai/A layby. Residue at 37-59 days up to 1.3 ppm at 2.0 + 2.0 lb ai/A PPI + layby exaggerated rate
ABR-86018	11	6	Pre/PPI/Post Tank mix, Prepack, 15G	Summary of data from GAAC-73064 (1972) up to this document (1985). Trials listed in this chloro-triazine summary for ABR 86018 have not been reported elsewhere. No detectable chloro-triazine residues in 30-day to 60-day field or sweet corn forage @ 2.0 lb ai/A.
ABR-87057	14	6	Pre, Post, Post + Oil @ 4.0 lbs ai/A	Summary of data from ABR-86018 **plus** 20 new trials. Highest residue at 37-59 day 0.44 ppm. Highest fodder 1.3 ppm.

Chloro-Triazine Residue Summary - Corn (continued)

Report Number	No. of Trials		Type of Application	Comments
	Field Corn	Sweet Corn		
ABR-87121	-	-	-	Tolerance Proposal document of 1987. Reduce corn/sorghum tolerances, change tolerances to include the chloro-triazines, and change PHI requirements
ABR-92028	5	-	Post to 12" corn	Exaggerated rate trials - 3, 6, 9, 15. lb ai/A treatments. At 3.0 lb ai/A rate, highest combined chloro-triazine residue at 30-days was 0.61 ppm. Highest at 54 to 70-day PHI was 0.42 ppm. Exaggerated rates were correspondingly higher.
ABR-92028 Amend-ment 1	-	-	Post to 12" corn	Grain Processing Phase of the study. (Not applicable to forage/stover input in dairy animal/beef cattle diet)
ABR-92068	-	-	^{14}C	Answers EPA questions regarding a potential "marker" residue in corn and sorghum
ABR-93046	4	-	Post + Crop Oil Concentrate to 12" corn	Rate (3.0 lb ai/A + COC) exceeds current label. Maximum combined chloro-triazine residue at 30-31 day PHI was 0.50 ppm. Maximum residue in 58-day forage to harvest fodder was 0.24 ppm.
ABR-91070	15	6	Pre and Post/Post + oil to 6" and12" corn	Rates exceed current label. Maximum combined chloro-triazine residues at 30-day and 60-day forage to 12" field corn were 2.3 ppm and 1.02 ppm, respectively, for the 3.0 or 3.0 + oil rate. Maximum sweet corn residues at 30- and 60-day PHIs were 0.20 ppm and 0.48 ppm, respectively, for the 3.0 lb ai/A treatments.
ABR-96087	15	5	Pre, PPI and Pre + Post/ PPI + Post to 12" corn	Rates correspond to the current label. Maximum combined chloro-triazine residues in Field Corn at 60 days following 0.5 lbs. ai/A PPI + 2.0 lbs. ai/A Post + oil was 1.252 ppm. Maximum combined chloro-triazine residues in Sweet Corn at 0.5 lbs. ai/A PPI + 2.0 lbs. ai/A Post + oil was 1.205 ppm at 45 days and 1.382 ppm at 83-101 days.
Total Trials	**118**	**40**		

Chloro-Triazine Methodology - Sorghum

The analytical methodology for the determination of atrazine and later atrazine plus the chloro-*s*-triazine metabolites G-28279, G-30033, and G-28273 in sorghum is the same as that developed for corn.

A survey of available documents generated by Ciba-Geigy Corporation/Novartis Crop Protection/Syngenta Crop Protection yielded nine reports generated for submittal or data recording purposes for atrazine issued since 1973 that provide data on atrazine and dealkylated chloro-triazine metabolites in sorghum. The reports are summarized in the following table: “Chloro-Triazine Residue Summary – Sorghum”.

Chloro-Triazine Residue Summary - Sorghum

Report Number	Number of Trials	Type of Application	Comments
GAAC-73064	3	Late Postemergence	All rates exceeded current label. Maximum combined chloro-triazine residues were 0.34 ppm for 3.0 lb ai/A post at 52 days. Maximum residue at 28 days for 2.0 lb ai/A + oil was 0.55 ppm.
ABR-78031	3	Pre and PPI	No detectable chloro-triazine residues (<0.25 ppm) at 55-62 days for 1.6 lb ai/A. One detect at 0.07 ppm in 116-day stover/fodder in MS.
ABR-79022	3	Pre and PPI w/wo fertilizer	No detectable chloro-triazine residues (<0.25 ppm) at 76-128 days for 1.6 lb ai/A
ABR-83052	5	Postemergence	No detectable chloro-triazine residues (<0.25 ppm) at 46-132 day intervals for 2.0 lb ai/A
ABR-87056	18	Postemergence, post + oil Preemergence	Twelve of 18 trials were within current label. Maximum combined chloro-triazine residues at 21 to 30 days following a 1.6 or 2.0 lb ai/A post treatment were 0.30 and 1.1 ppm.
ABR-93079	1	Postemergence	All tested rates exceed current label. The maximum combined chloro-triazine residues for 3.0 lb ai/A were 1.2 ppm at a 34-day PHI.
ABR-93080	4	Postemergence to 12" sorghum	All tested rates exceed current label. The maximum combined chloro-triazine residues for 3.0 lb ai/A in 28-31 day forage and 28-31 day hay were 2.49 ppm and 1.24 ppm, respectively.
ABR-91071	14	Pre, Post, Post + oil applications to 6" and 12" sorghum	Most tested rates exceed current label. The highest combined chloro-triazine residues for a 2.38 lb ai/A preemergence treatment ranged from 0.34 ppm to 0.65 ppm in 60-day forage and hay. The highest combined chloro-triazine residues from a 1.2 lb ai/A + oil postemergence treatment was 0.13 ppm in a 60-day hay sample.
ABR-96088	9	Pre/PPI (2.0 lb ai/A), Pre/PPI (0.50 lb ai/A) + maximum post (2.0 lb ai/A), Pre/PPI (1.3 lb ai/A) + maximum post (1.2 lb ai/A) + oil	All tested rates were within current label. The maximum Pre/PPI residues in 60-day forage were 0.093 ppm to 0.21 ppm. The maximum residues for Pre/PPI + post were 0.091 ppm to 0.094 ppm.
Total	**57**		

Appendix 2 of Attachment 3

ANALYTICAL ENFORCEMENT METHODOLOGY FOR HYDROXY-TRIAZINES

Ratios of Free Hydroxy-Triazines in Corn, Sorghum and Sugarcane

The Agency is considering the four free hydroxy-triazine metabolites of atrazine (G-34048, GS-17794, GS-17792 and GS-17791) for regulation in raw agricultural commodities, and has requested Syngenta to include GS-17791 and GS-17792 in the previously submitted analytical enforcement method for analysis of hydroxy-triazines. Syngenta submitted Analytical Method AG-596 (MRID 42547119) and associated method validation study (MRID 42547118) as part of our response to the Atrazine Reregistration Data Call-In (October 1990). Analytical Method AG-596 determines hydroxy-triazine metabolites G-34048 and GS-17794 in crops.

An examination of the relative concentrations of the four hydroxy-triazine metabolites in numerous plant metabolism studies (see attached table) indicates that the desethyl-hydroxy atrazine (GS-17794) is by far the most predominant hydroxy-triazine in this residue class. Based on the concentrations of free hydroxy-triazines found in the corn, sorghum and sugarcane metabolism studies, the concentration of GS-17794 relative to the total free hydroxy-triazines is remarkably consistent at 70% of the total free hydroxy-triazines. This relationship holds regardless of the overall TRR, application regime, commodity or growth stage of the crop. Therefore, this moiety is suitable as a marker residue for the free hydroxy-triazines to allow for the enforcement of a tolerance for this class of metabolites. Additionally, if all four hydroxy-triazines are to be considered for calculation of dietary exposure, application of a mathematical factor to estimate total free hydroxy-triazine concentrations from GS-17794 concentrations is appropriate. A marker approach for enforcement of hydroxy-triazines was considered in a March 1993 review of a registrant response to the October 1990 Atrazine Reregistration Data Call-In. The toxicology endpoint for hydroxy-atrazine was under review at the time and a decision regarding this approach was deferred until the Agency made the toxicological endpoint determination (Conclusion 1(g) from CBRS No. 10980, DP Barcode No. D185491). Now that the toxicological endpoint for hydroxy-atrazine has been determined, Syngenta requests that consideration again be given to this marker approach for hydroxy-triazines.

Atrazine: Free Hydroxy-Triazine Residues In Corn, Sorghum and Sugarcane ^{14}C-Metabolism Studies					
CORN					
	Percent TRR (ppb Total Hydroxy)	**Percent of Total Hydroxys (ppb)**			
		G-34048	**GS-17794**	**GS-17792**	**GS-17791**
2 LB PREEMERGE-IL					
Forage	19.7(6.1)	3.8(0.8)	**59.8(3.9))**	18.4(1.2)	3.3(0.2)
Silage	19.3(5.5)	<4.0(<0.2)	**72.7(4.0)**	21.8(1.2)	5.5(0.3)
Fodder	23.3(12.4)	1.6(0.2)	**80.6 (10)**	16.9(2.1)	8 (0.1)
Grain	2.2(0.6)	<10 (<0.1)	**66.7(0.4)**	16.7(0.1)	16.7(0.1)
3 LB POSTEMERGE -MS					
Forage	27 (188)	11.1(21)	**67.0(126)**	16.5 (31)	5.3 (10)
Silage	25.7(170)	2.3 (4)	**74.7(127)**	17.6 (30)	5.2 (9)
Fodder	19.1(162)	2.5 (4)	**76.5(124)**	17.2 (28)	3.7 (6)
Grain	3.9 (1)	---- (ND)	*** (1)**	* (<1)	* (<1)
3 LB POSTEMERGE -IL					
Forage	26.1(121)	15.7 (19)	**64.5 (78)**	15.7 (19)	4.1 (5)
Silage	28.6(203)	8.4 (17)	**67.5(137)**	17.7 (36)	6.4 (13)
Fodder	24.7(447)	9.4 (42)	**68.5(306)**	18.1 (1)	4.0 (18)
Grain	9.7 (7)	---- (ND)	**57.1 (4)**	14.2 (1)	28.5 (2)
3 LB POSTEMERGE -NY					
Forage	12.3(349)	19.5 (68)	**65.9(230)**	14.6 (51)	5.7 (20)
Silage	20.7(103)	---- (ND)	**87.4 (90)**	9.7 (10)	2.9 (3)
Fodder	17.1(265)	6.4 (17)	**83.8(222)**	9.8 (2)	---- (ND)
Grain	13.1 (4)	* (<1)	*** (4)**	* (<1)	* (<1)
			Mean - 70.9%		
			SD - 8.5% (n=14)		
*** = Not enough data to make a meaningful calculation; ND = No residue detected**					

Atrazine: Free Hydroxy-Triazine Residues In Corn, Sorghum and Sugarcane ^{14}C-Metabolism Studies (Continued)					
SORGHUM					
	% TRR	% of Total Hydroxys (ppb)			
	(ppb Total Hydroxy)	G-34048	GS-17794	GS-17792	GS-17791
<u>2 LB PREEMERGE-IL</u>					12 (0.1)
Forage	1.4(0.8)	---- (<0.1)	**87.5(0.7)**	---- (<0.1)	* (<0.1)
Silage	1.1(0.3)	* (<0.1)	*** (0.3)**	* (<0.1)	9.1(0.1)
Fodder	4.6(1.1)	---- (<0.1)	**63.6(0.7)**	27.2(0.3)	---- (<0.1)
Grain	5.1(0.3)	---- (<0.1)	*** (0.1)**	* (2)	
<u>3 LB POSTEMERGE-MS</u>					10.1 (29)
Forage	9.9(287)	5.2 (15)	**78.7(223)**	7.0 (20)	11.4 (10)
Silage	7.1 (88)	---- (ND)	**67.0 (59)**	21.6 (19)	9.8 (8)
Fodder	9.0 (82)	3.7 (3)	**63.4 (52)**	23.2 (19)	19.2 (5)
Grain	6.6 (26)	---- (ND)	**53.8 (14)**	26.9 (7)	
<u>3 LB POSTEMERGE-IL</u>					17. (10)
Forage	6.2 (56)	5.4 (3)	**69.6 (39)**	7.1 (4)	7.7 (1)
Silage	2.1 (13)	---- (ND)	**61.5 (8)**	30.7 (4)	11.5 (13)
Fodder	6.1 (26)	---- (ND)	**69.2 (18)**	19.2 (5)	* (<0.1)
Grain	2.9 (3)	---- (<1)	*** (<0.1)**	* (<0.1)	
<u>3 LB POSTEMERGE-NY</u>					17.0 (21)
Forage	3.1(166)	6.6 (11)	**74.1(123)**	6.6 (11)	9.2 (5)
Silage	5.1 (54)	---- (ND)	**85.2 (46)**	5.6 (3)	12.7 (9)
Fodder	6.8 (71)	5.6 (4)	**62.0 (44)**	19.7 14)	* (<0.1)
Grain	2.9 (1)	* (<0.1)	*** (<0.1)**	* (<0.1)	
			Mean = 69.9%		
			SD = 9.5%, n=12		
SUGARCANE					
Cane	14.2(295)	16.9 (50)	**71.% (211 ppb)**	5.8 (17)	6.4 (19)
			Overall Mean = 70.5%		
			SD = 8.8%, n=27		
*** = Not enough data to make a meaningful calculation; ND = No residue detected**					

Hydroxy-Triazine Residues in Livestock Fed Commodities

According to the recent review on Anticipated Residues and Acute and Chronic Dietary Exposure Assessments for Atrazine, Revised January 2001, the HED ChemSARC concluded on 10/11/2000 that a 40 CFR 180.6(a)3 condition exists with regard to hydroxy-triazine metabolites in livestock commodities. Thus, no hydroxy-triazine tolerances are necessary for livestock and poultry commodities. Based on transfer factors calculated from studies in which livestock were fed either ^{14}C-labeled atrazine, ^{14}C-labeled hydroxy-atrazine or dent-stage corn (after pre-emergence application of ^{14}C-atrazine), finite residues of hydroxy-triazines would not be expected in livestock commodities. This decision was based on studies in which livestock and poultry were fed more than 50X the theoretical total dietary burden resulting in only negligible hydroxy-triazine residues in tissues, milk, and eggs.

Since no tolerances for hydroxy-triazines are needed for livestock and poultry commodities, Syngenta respectfully requests a waiver for the need of a hydroxy-triazine tolerance enforcement method (and associated tolerances) in commodities fed *only to livestock* (corn and sorghum forage, silage, and fodder; and wheat forage, hay, and straw). Since transfer of hydroxy-triazine residues to livestock and poultry is not anticipated, no issues exist unless a gross misuse of the product is encountered, and this would most certainly be revealed in over-tolerance chloro-triazine residues on the corresponding crops.

A validated data collection method based on the marker residue GS-17794 has been submitted to the Agency. Residue Analytical Method AG-596 would allow for monitoring and data collection of hydroxy- triazine residues in a case of product misuse or when emergency data collection is necessary.

Hydroxy-Triazine Residues in Direct Human Consumption Commodities

For commodities that are consumed directly by humans, Analytical Method AG-596 serves to quantitate the major hydroxy-triazine residue. Examination of the hydroxy-triazine data from numerous metabolism and residue studies for crop commodities directly consumed by humans (corn processed commodities, sweet corn, wheat processed commodities, refined sugar, molasses, guava and macadamia nuts), shows that CGA-17794 is the predominant (and often only) hydroxy-triazine residue found in detectable quantities. Syngenta agrees with the Agency that it may be appropriate to set hydroxy-triazine tolerances in these commodities; thus, a tolerance enforcement method based on GS-17794 as a marker would be adequate for assessment of free hydroxy-triazines.

The validated methodology for GS-17794 submitted to the Agency has been determined to be adequate. The method should be forwarded to ACB for PMV testing.

Conclusions

Based on the information in the numerous MOR and metabolism studies, Syngenta believes that GS-17794 meets the criteria for a marker residue for the enforcement of tolerances for hydroxy-triazines in crop commodities directly consumed by humans. Since a 40 CFR 180.6(a)3 condition exists for hydroxy- triazine residues in livestock and poultry commodities, no hydroxy-triazine tolerance enforcement method should be required for animal commodities or for commodities which are fed only to livestock and poultry. A fully validated method which supports the enforcement of hydroxy-triazine tolerances based on the determination of GS-17794 as a marker residue has been submitted to the Agency and should be forwarded on for an Agency Method PMV.

Attachment 4

Syngenta's Comments on EPA's January 19, 2001 "Atrazine. HED's Revised Preliminary Human Health Risk Assessment for the Reregistration Eligibility Decision (RED)"

Total Chloro-Triazine Concentrations in Surface Water Calculated from Atrazine Concentrations Listed in the PLEX, VMS, and ARP Databases

Surface Water – Deterministic Assessment

Methodology Corrections:

For the existing atrazine annual means provided in the PLEX database, EPA applied the annual regression equation to estimate total chloro-triazine annual means for the CWSs in PLEX. Instead the four quarterly regressions should have been applied to the individual atrazine data points within each quarter to determine individual total chloro-triazine concentration for each quarterly sample, then the four quarters should be averaged.

Estimated seasonal mean water concentrations included in the EPA preliminary assessment for VMS and ARP data sets were calculated by using the EPA quarterly equations to calculate total chloro-triazine residues for each sample followed by arithmetic averaging of the residues over a timeframe. Syngenta strongly believes that time weighting of the residue concentrations should be used, particularly for the Voluntary Monitoring Study (VMS) and the Acetochlor Registration Partnership (ARP) data sets, where samples have been taken more frequently during the use season and there are generally several samples in a quarter. In addition, when data exists for a CWS in multiple data sets (i.e., PLEX, ARP, VMS), these data sets should be combined before determining exposure. The sum of all data adds to the understanding of time dependent variability leading to a more robust and defendable assessment of exposure. Time-weighting results are of particular importance when data from studies with different sampling intervals is used in the assessment.

EPA has stated in their response to Syngenta's Comments on the Preliminary Human Health Assessment that, because differences exist in 1) the number of sampled CWSs, 2) the sampling dates, and 3) the detection limits, the data sets are incompatible and that only data on the "selected few" CWSs can be pooled. The "selected few" are generally the CWSs with the higher atrazine detections and therefore included in supplemental studies. Differences in sampling dates is actually a benefit in terms of identifying peak concentrations. The issue of detection limits and handling censored data from different studies can be approached statistically.

The use of the maximum seasonal or annual means should only be used to assess exposure for those time frames, i.e. 90 or 365 days, respectively. These means should not be used to establish long term exposure levels at a CWS, where data exists over a longer, more appropriate, time frame. Since these data sets generally contain residue levels over a period of several years, an appropriate period mean covering the exposure period being addressed should be used where possible for chronic exposure assessments. This would greatly improve the validity of the exposure assessment presented in the EPA revised risk assessment. Additionally, the comparison of the 3-month average concentration to a DWLOC based on a chronic toxicology endpoint is not scientifically appropriate.

To assess exposure more accurately using a deterministic approach, Syngenta has combined the three data sets (VMS, ARP, and PLEX) for the CWSs listed in EPA's revised preliminary risk assessment as well as those listed in Appendix E. The total chloro-triazines were estimated from the parent atrazine using the EPA derived equations. Next, a time-weighting of each data point was performed by assigning the residue value of a sample to each day going back one half of the days to the previous sample date and forward one half of the days to the next sampling date. The time-weighted mean was calculated by adding the residue values for each day and dividing by the number of days in the period being determined. This process allowed for the evaluation of 40 to 50 samples per year in several CWSs which provides a more robust distribution of sampling events than the 20 to 30 in either the ARP or VMS programs alone and hence a more realistic characterization of exposure.

The resulting exposure assessments using a deterministic approach indicated that five CWSs had time-weighted annual means over the 12.5 ppb level of comparison proposed by EPA using the most conservative assumptions, i.e., new OW body weights (DWLOC is 18.0 ppb using standard body weight), a 1000 fold safety factor, and an endpoint derived from LH surge suppression in sexually mature adult rats (see Table 1 below). These CWSs are Dearborn, MO, Hettick, IL, Palmyra-Modesto, IL, Salem, IL and Shipman (20 ppb). None of these exceed the DWLOC for infants <1 year determined by using a more appropriate toxicology endpoint (Table 3 of Executive Summary). None of the CWSs had five year period means over 18 or 23 ppb (EPA calculated DWLOC values) for children 1-6. It should be noted that Shipman no longer provides drinking water from the source monitored. In 1999, Shipman switched its water source to another surface water CWS (Alton, Illinois) and the annual means have dropped well below any of the calculated DWLOCs. The period mean for Shipman for 1993-1999 is 6.58 ppb chloro-triazines.

<u>Surface Water – Probabilistic Assessment</u>

A probabilistic exposure assessment using the same composite database was included with the Syngenta Comments, dated December 22, 2000, on the Preliminary Human Health Risk assessment to assess risk from diet and water in the high exposure CWSs. The water assessment is included again with these comments (Attachment 12). Based upon this analysis it is concluded that the total chloro-triazine residues of atrazine in diet and drinking water do not pose a risk to individuals drinking water from the CWSs with the highest total chloro-triazine concentrations.

Table 1

Community Water System	State	EPA Review Highest Residue Found (ppb)	EPA Review Highest Annual Average (ppb)	Syngenta Highest Annual TWM for Combined Data (ppb)	Syngenta Period TWM for Combined Data (ppb)
Shipman	IL		24.8	20.5	6.6
Hettick	IL		22.9	19.1	8.4
Palmyra-Modesto	IL		18.5	15.0	4.7
Salem	IL	89	20.4	14.2	3.9
Dearborn	MO		14.3	13.8	4.3
Sardinia	OH	55.2	15.0	11.5	2.8
White Hall	IL		12.1	10.9	3.7
Holland	IN			10.2	2.8
Paris	IL	18.7		10.2	3.0
Gillespie	IL	69.1	12.6	9.4	3.7
Scottsburg	IL			9.3	2.6
Vermont	IL	17.3		9.1	2.3
Higginsville	MO			9.1	2.8
Osawatomie, Miami Co RWD #3	KS	17.3		9.0	3.3
Batesville	IN			8.5	3.8
Farina	IL			8.3	4.6
Bucklin	MO			7.5	1.8
Adrian	MO	22.9		7.0	1.7
ADGPTV	IL			7.0	3.5
Keysport	IL	18.7		6.9	4.0
West Salem	IL			6.7	3.9
Sorento	IL			6.7	2.9
Hillsboro	IL		12.2	6.1	3.0
Centralia	IL			6.1	3.3
Springfield	IL	20.1		5.9	2.4
Lake of the Woods, Sunbury	OH	18.1		5.8	4.0
Chariton	IL		2.0	5.8	2.3
Delaware	OH	19.8		5.8	3.2
Carlinville	IL			5.6	2.5
Wayne City	IL			5.6	1.6
North Vernon	IN			5.5	2.2
Iberville	LA			5.3	3.2
Vandalia	MO			5.0	2.8
Louisville	IL	24.3		5.0	3.5
Butler	MO	18.7		4.5	1.4
Kinmundy	IL			4.3	2.5
Clay City	IL	18.7		4.3	1.8
Three Rivers	IN	20.1		4.0	1.3
Flora	IL			3.8	2.6
Waverly	IL			3.8	2.7
Newark	OH	29.7		3.5	1.5
Napoleon	OH	17.9		3.3	2.5
McClure	OH	20.1		2.1	1.7

In order to make a more direct comparison of the EPA results with the alternative methods proposed herein, Syngenta is also submitting in the next section an assessment in which the total chloro-triazine estimates from each of the three databases are treated separately using the standard time-weighting procedure (three monthly averages are averaged to a quarterly average – four quarterly averages are averaged to an annual average – annual averages are averaged into period means).

Total Chloro-Triazine Concentrations in Surface Water Calculated from Atrazine Concentrations

PLEX, VMS, and ARP Databases Treated Separately

Detailed comments from specific sections of document

Section 4.2.2 Drinking Water (pp 60-84); Section 5.0 Aggregate Risk Assessments and Risk Characterization (pp 113-116) and Section 6.0 Data Requirements (pp 116-117) EPA Tables 10, 11, 12, 13, & 14

GENERAL COMMENT: Syngenta disagrees on a scientific basis with the development of seasonal means for comparison with chronic DWLOC for various sub-populations. The chronic endpoint on which the DWLOCs are based is an effect in the rat with onset after six months of treatment which translates in terms of human exposure duration to an exposure period of many years. Annual or period means are much more appropriate for addressing exposure to atrazine in drinking water. However, for the purpose of comparing Syngenta findings directly with EPA conclusions, seasonal means have been calculated as discussed below. Also, because exposure through drinking water has generally decreased in recent years, it is important to use the most current data from 1999-2000. Syngenta will recalculate the values shown below using surface water data from the last three years to better assess the trend toward lower exposures and more accurately target specific watersheds for future stewardship and implementation of Best Management Practices. Syngenta will provide EPA in the near future with an analysis of PLEX VI which provides values for the total chloro-triazines from 1999 Monitoring CWS in the 31 major use states. (See Appendix 1 of this Attachment for details on the PLEX VI calculations.)

1. The revised preliminary risk assessment did not include a time-weighting procedure in the development of seasonal means for the CWSs identified in Tables 11 and 14. These data are from three databases: Syngenta PLEX, Syngenta VMS, and ARP. The latter two databases are monitoring programs with weekly and biweekly sampling frequency in the May to July period each year. When there is an unequal sampling frequency, the valid statistical calculation is a time-weighted mean that more accurately determines the

seasonal and period means than the arithmetic calculation. EPA has stated that the arithmetic mean is sometimes higher and sometimes lower than the time-weighted mean. The time-weighted mean, regardless of the outcome, represents better scientific methodology for estimating actual average exposures over various time periods. Table 1 shows a comparison of EPA and Syngenta calculated maximum, seasonal, and annual total chloro-triazine time-weighted mean concentrations for the CWSs identified in EPA Tables 10, 11, 13, and 14.

TABLE 1
COMPARISON OF MAXIMUM, SEASONAL AND ANNUAL ATRAZINE AND TOTAL CHLOROTRIAZINE CONCENTRATIONS BY EPA-OPP, NOVARTIS ATRAZINE VOLUNTARY MONITORING PROGRAM , PLEX UPDATE V, AND THE ACETOCHLOR REGISTRATION PARTNERSHIP PROGRAM

	EPA Total Chlorotriazine (ppb)						Atrazine and Total Chlorotriazine (ppb) Total Chlorotriazine Estimated Using EPA Quarterly Regressions								
					EPA 11/30/01	EPA 1/19/01		Maximum		Seasonal		Annual		Period	
CWS	Source	Year	Maximum	Seasonal	Annual	Annual	Year	Parent	Total	Parent	Total	Parent	Total	Parent	Total
Gillespie, IL	Arp	1996	69.08	32.17	12.58	11.0	1996	49.48	69.08	21.76	31.11	6.62	9.79	3.06	4.73
	Plex	1996	59.80	-	11.80	11.8	1996	42.00	58.66	-	-	8.16	11.87	2.70	4.17
Hettick, IL	Vmp	1994	21.93	16.50	12.47	-	1994	15.63	21.93	11.50	17.14	6.99	11.13	6.59	10.45
	Vmp	1996	54.65	32.86	22.87	18.6	1996	39.13	54.65	24.58	35.91	12.93	20.23	6.59	10.45
	Plex	1996	15.84	-	12.33	12.33	1996	11.00	18.87	-	-	8.53	13.56	4.14	6.78
	Vmp	1998	32.27	19.27	13.89	-	1998	23.07	32.27	14.12	21.16	6.64	10.56	6.59	10.45
Shipman, IL	Vmp	1993	24.80	(24.79)	-	-	1993	17.71	24.79	12.44	19.48	8.65	13.02	5.32	8.42
	Vmp	1994	20.32	13.09	10.09	-	1994	12.80	20.32	10.31	15.37	5.35	8.52	5.32	8.42
	Vmp	1996	47.87	39.14	24.75	18.9	1996	31.19	47.87	24.14	36.38	13.18	21.07	5.32	8.42
	Arp	1996	48.41	33.86	24.10	17.6	1996	34.65	48.41	23.11	34.42	11.79	18.72	3.48	5.63
	Plex	1996	27.18	-	13.07	13.07	1996	19.00	32.50	-	-	9.05	14.73	4.24	6.72
Salem, IL	Vmp	1993	61.61	(61.61)	-	-	1993	44.12	61.61	18.18	26.53	15.89	22.63	4.76	7.05
	Vmp	1994	88.96	42.45	20.35	13.1	1994	63.74	88.96	27.04	38.86	9.04	13.64	4.76	7.05
Palmyra-Modesto, IL	Vmp	1993	19.52	(19.52)	-	-	1993	13.93	19.53	10.63	16.79	8.39	12.89	4.07	6.42
	Vmp	1994	25.14	21.92	18.47	13.5	1994	22.23	31.10	16.01	23.83	9.35	14.70	4.07	6.42
	Plex	1994	17.26	-	11.65	11.65	1994	12.00	16.84	-	-	8.05	12.48	2.59	4.09
Hillsboro, IL	Vmp	1994	42.93	19.27	8.30	-	1994	30.72	42.93	10.93	15.46	3.60	5.42	1.74	2.77
	Plex	1994	42.78	-	12.15	12.15	1994	30.00	41.93	-	-	8.40	12.09	2.39	3.71
Farina, IL	Vmp	1993	24.80	(24.79)	-	-	1993	17.71	24.79	13.23	20.83	10.03	15.30	3.81	6.06
Kinmundy, IL	Vmp	1993	25.48	(24.79)	-	-	1993	17.71	25.48	8.14	12.16	6.67	9.65	2.36	3.75
ADGPTV, IL	Vmp	1993	20.85	(20.85)	-	-	1993	14.88	20.85	8.59	13.22	6.91	10.33	2.91	4.56
	Vmp	1994	19.26	11.66	7.96	-	1994	13.74	19.26	8.17	12.20	4.22	6.63	2.91	4.56
Carlinville, IL	Arp	1995	15.27	12.28	8.22	-	1995	9.94	15.27	8.03	12.19	4.18	6.76	1.73	2.82
	Vmp	1996				11.8	1996	4.60	7.28	2.65	4.02	1.33	2.15	1.32	2.19
West Salem, IL	Arp	1995	28.66	17.27	8.15	-	1995	16.75	28.67	6.07	9.95	4.53	7.58	2.36	3.85
Flora, IL	Arp	1996	31.74	12.29	6.72	-	1996	22.69	31.74	7.84	11.18	2.41	3.65	1.76	2.76
Sorento, IL	Arp	1996	16.99	11.94	7.51	-	1996	9.90	13.91	6.96	10.47	4.04	6.53	1.95	3.22
White Hall, IL	Vmp	1996	19.91	17.51	12.07	-	1996	12.14	19.91	9.79	14.82	6.89	11.16	2.61	4.23
	Arp	1996	17.94	16.41	11.32	-	1996	12.79	17.94	9.80	14.78	6.43	10.37	3.68	6.00
Centralia, IL	Vmp	1996	24.86	17.28	7.37	-	1996	14.52	24.87	6.64	10.72	3.58	6.00	2.26	3.72
Wayne City, IL	Vmp	1993	16.90	(16.91)	-	-	1993	12.05	16.90	6.78	10.43	5.98	9.03	1.39	2.24
Batesville, IN	Arp	1997	16.98	14.67	6.98	-	1997	9.89	16.98	4.42	7.18	4.96	8.27	2.57	4.28
Holland, IN	Arp	1995	26.19	21.16	10.80	-	1995	15.3	26.19	7.35	11.77	6.59	10.92	1.91	3.22
North Vernon, IN	Arp	1995	31.28	12.74	5.62	-	1995	18.28	31.27	5.92	9.83	2.65	4.53	3.53	5.62
Scottsburg, IN	Arp	1996	25.51	22.95	10.45	-	1996	14.9	23.48	9.44	14.67	5.98	9.84	1.78	3.02
Chariton, IA	Vmp	1998	21.04	12.01	7.02	-	1998	11.43	18.08	7.34	11.25	3.61	5.88	1.48	2.48
Iberville, LA*	Vmp	1997	60.55	16.83	6.44	-	1997	39.30	60.55	10.69*	16.01*	3.42	5.21	2.56	3.91
Bucklin, MO	Vmp	1997	17.66	15.71	7.69	-	1997	12.59	17.66	5.39	8.62	4.45	7.43	2.66	4.45
Higginsville, MO	Arp	1996	25.51	22.95	10.45	-	1996	1.73	2.88	1.04	1.66	1.00	1.69	0.92	1.58
Vandalia, MO	Arp	1996	26.35	17.10	8.53	-	1996	15.39	26.35	7.5	11.82	3.54	5.86	1.61	2.71
	-	-	-	-	-	-									
Sardinia, OH	Plex	1996	55.16	-	14.98	14.98	1996	38.73	54.10	-	-	10.40	14.83	3.27	4.83
Drexel, MO	Plex	1994	38.53	-	16.97	16.97	1994	27.00	37.75	-	-	11.80	18.02	3.09	4.86
Dearborn, MO	Plex	1994	27.18	-	14.33	14.33	1994	19.00	26.59	-	-	9.94	15.47	2.56	4.10

* Iberville, LA Calculated Seasonal Averages Using Atrazine Voluntary Monitoring Data were Calculated from February through April, the Atrazine High Use Season in the Area.

( ) Records are Seasonal Averages for 1993 VMP that are not Documented in Henry's Attachments

2. EPA developed quarterly and annual regression equations to estimate total chloro-triazine (TCT) to be used with the PLEX, VMS, and ARP databases. EPA only applied the annual regression equation to existing atrazine annual means provided in PLEX to estimate total chloro-triazine annual means for the CWSs in PLEX. Instead, application of the four quarterly regressions to the individual atrazine datapoints within each quarter to determine individual total chloro-triazine concentration for each sample is a more scientifically valid approach. Individual sample total chloro-triazine concentrations should then be time weighted within each quarter to obtain a single quarterly concentration. Quarterly concentrations are then averaged to determine an annual time weighted total chloro-triazine mean concentration for each CWS. This is calculated on an annual basis for each year in the six year PLEX database. Syngenta has followed the procedure outlined here for the development of time-weighted total chloro-triazine annual mean concentrations in our revision of the PLEX CWS annual means shown in Table 1.

3. For the VMS and ARP databases, to the best of our knowledge, EPA first applied the four quarterly regressions to individual atrazine sample results to determine corresponding total chloro-triazines for each sample, then calculated the seasonal total chloro-triazine means arithmetically (not time-weighted) for each CWS in the VMS and ARP databases. As stated above, more scientifically valid methods exist for estimating average exposures and calculating seasonal means as described in the following procedure. Individual sample total chloro-triazine concentrations, determined with the appropriate quarterly regression equation, within each month were averaged to obtain a single monthly concentration. Monthly concentrations were then averaged to obtain a 3-month seasonal concentration for each CWS. This was calculated on a seasonal basis for each year in the VMS and ARP databases and the results are shown in Table 1. Tables 11 and 14 should be revised to reflect the more refined assessment using time-weighting.

4. EPA identified eleven CWSs with total chloro-triazine seasonal mean (mean of highest three months per year) concentrations above 18 ppb in Table 11 (p. 72-74). The CWS seasonal means in Table 11 were derived from the VMS and ARP databases and were not calculated in a time-weighted manner. Additionally, the seasonal means reported for six CWSs in Illinois in 1993 were based on one sample date in June (the VMS started in late June in 1993). The use of single sample date concentration does not conform to the method reported by EPA, i.e. “seasonal mean concentrations were calculated based on weekly concentrations from May to July” (p.58). A 3-month time-weighted mean concentration should be calculated over the months of June, July, and August for the six CWSs in Illinois where sampling began in June.

This seasonal mean would more accurately represent the drinking water exposure over the 3-month period rather than the single highest concentration from one sample in June. The populations of these six CWSs in Illinois were not exposed for a three month period to the total chloro-triazine levels reported in EPA's Table 11. The level reported for these six CWSs is the maximum single residue detected during the entire year of 1993 and should be deleted from the seasonal average column in the EPA Tables.

Syngenta calculated (Table 1) time-weighted seasonal total chloro-triazine means for the eleven CWSs noted on EPA Table 11. Five of the eleven CWSs for the appropriate year should be removed from Table 11 since the seasonal time-weighted means are below the EPA proposed DWLOC of 18 ppb in Table 9. These CWSs are Kinmundy (1993), ADGPTV(1993), Palmyra-Modesto (1993), Scottsburg (1996), and Holland (1995). Values for the remaining six CWSs in Table 11 should be replaced with the time-weighted seasonal mean concentrations (Table 1).

5. EPA identified four CWS, some with multiple years, with total chloro-triazine annual mean concentrations approaching, equal to, or above the EPA proposed chronic DWLOC of 12.5 ppb in Table 13 (p. 76). These data are from the Syngenta PLEX, Syngenta VMS, and ARP monitoring programs. The annual means for the VMS and ARP data in Table 13 were calculated using the parent atrazine concentrations, which were time-weighted, then the annual total chloro-triazine residues were calculated using the annual regression equation. Syngenta calculated the annual means by applying the appropriate quarterly regression to each atrazine value first, then time-weighting the total chloro-triazine values. Four of the ten CWSs listed by EPA have annual mean concentrations below the EPA proposed DWLOC of 12.5 ppb using either the EPA or Syngenta calculated values. They are Gillespie (1996), Hillsboro (1994), Palmyra-Modesto (1994) and Carlinville (1996). Values for the remaining CWSs above 12.5 ppb in EPA Table 13 should be replaced with the time-weighted values in Table 1.

6. The EPA risk assessment identified 24 CWS with total chloro-triazine seasonal mean concentrations approaching, equal to, or above the EPA proposed chronic DWLOC of 12.5 ppb in Table 14 (p. 77-80). The seasonal means were not calculated in a time-weighted manner. The time-weighted seasonal means for the 24 CWSs (based on VMP and ARP databases) are provided in Table 1. The Chariton (1998), Flora (1996), Sorento (1996), ADGPTV (1994), and Carlinville (1995) CWSs should be removed from Table 14 because they do not exceed 12.5 ppb using either the Syngenta or EPA calculation.

Based on Syngenta recalculated time-weighted seasonal means, (quarterly regression equations applied to individual samples) nine CWSs have a seasonal mean less than the EPA proposed chronic DWLOC of 12.5 ppb and should be removed from Table 14. Values for the remaining eleven CWSs in EPA Table 14 should be replaced with the time-weighted values in Table 1 and highlighted in Table 2 below.

Table 2

Comparison of Arithmetic and Time-weighted Total Chloro-Triazine seasonal mean (TWM) concentrations for 24 CWSs listed in EPA Table 14 (p. 77-80)

CWS	Year	Seasonal Mean EPA (ppb)	Seasonal TWM VMP (ppb)	Seasonal TWM ARP (ppb)
Hettick, IL	1998	19.27	21.16	
*Chariton, IA	1998	12.01	11.25	
Iberville, LA	1997	16.83	16.01	
Bucklin, MO	1997	15.71	8.62	
Shipman, IL	1996	39.14	36.38	
Hettick, IL	1996	32.86	35.91	
White Hall, IL	1996	17.51	14.82	
Centralia, IL	1996	17.28	10.72	
Salem, IL	1994	42.45	38.86	
Palmyra-Modesto, IL	1994	21.92	23.83	
Hillsboro, IL	1994	19.27	15.46	
Hettick, IL	1994	16.50	17.14	
Shipman, IL	1994	13.09	15.37	
*ADGPTV, IL	1994	11.66	12.20	
Salem, IL	1993	61.61	26.53	
Farina, IL	1993	24.79	20.83	
Kinmundy, IL	1993	24.79	12.16	
Shipman, IL	1993	24.79	19.48	
ADGPTV, IL	1993	20.85	13.22	
Palmyra-Modesto, IL	1993	19.52	16.79	
Wayne City, IL	1993	16.91	10.43	
Batesville, IN	1997	14.67		7.18
Shipman, IL	1996	33.86		34.42
Gillespie, IL	1996	32.17		31.11
Scottsburg, IN	1996	22.95		14.67
Vandalia, MO	1996	17.10		11.82
White Hall, IL	1996	16.40		14.78
*Flora, IL	1996	12.29		11.18
*Sorento, IL	1996	11.94		10.47
Holland, IN	1995	21.15		11.77
West Salem, IL	1995	17.26		9.95
North Vernon, IN	1995	12.74		9.83
*Carlinville, IL	1995	12.28		12.19

* Less than 12.5 ppb, EPA calculated and Syngenta recalculated
Boxed CWS are less than 12.5 ppb based on recalculated time-weighted Means (quarterly regressions applied to individual samples)

7. The seasonal (3-month) means for Illinois CWSs in the 1993 VMP as presented in Table 14 are based on one sample in June. See comment 4 above. The time-weighted seasonal means (June, July, August) were calculated for the seven CWSs in Illinois in 1993 and are shown in Tables 1 and 2 and should replace the concentrations for the seven CWSs now in EPA Table 14.

8. EPA identified CWSs in Tables 10, 11, 13, and 14 with annual and seasonal total chloro-triazine means approaching, equal to, or exceeding the EPA proposed DWLOC of 18.0 ppb or 12.5 ppb. CWSs with annual or seasonal means less than 18.0 or 12.5 ppb should be removed from the list

9. EPA identifies the proposed chronic DWLOC for the eight population subgroups in Table 12 (p. 75). The agency compares the chronic DWLOCs to (1) the total chloro-triazine annual mean concentrations for the CWSs in the three databases and (2) the seasonal (highest 3-month period per year) total chloro-triazine mean concentration from the VMP and ARP databases for each CWS. Comparison of seasonal mean chloro-triazines (highest 3-month period per year) with a chronic DWLOC is not scientifically justified. The chronic DWLOC should instead be compared to the period mean total chloro-triazine concentration for each CWS based on the number of years monitored. The PLEX database has six years of data for most CWSs. The Syngenta Voluntary Monitoring Program (VMP) has five years (1994-1998) for most CWSs and six years for some CWSs in Illinois (Jun-Dec 1993-1998). The ARP database has three years (1995-1997) of data.

   EPA states (p.57) that: “estimates of chronic risk are based on estimates of long-term, average exposures”. Clearly, the period mean exposure concentration (based on an average of annual means for the number of consecutive years monitored) in finished water for each CWS is such a long-term, average exposure. The CWSs in Table 10 (p.71), Table 11 (p. 72-74), Table 13 (p.76) and Table 14 (p.77-80) should have a column added with the total chloro-triazine period mean concentration compared to the chronic DWLOCs for the eight population subgroups. Alternately, EPA could develop separate tables to compare the DWLOC for the eight population subgroups to the total chloro-triazine period mean concentration for the CWS as companion Tables to Tables 10,11,13,14.

10. EPA identified two CWS with total chloro-triazine annual means at or above the EPA proposed chronic DWLOC of 18 ppb in Table 10 (p.71). Syngenta has calculated the total chloro-triazine annual period means for each CWS identified in Table 10 (p.71). The time-weighted period mean concentrations for the two CWS from the PLEX (1993-1998), VMP (1993-1998) and ARP (1995-1996) databases are shown in Table 3. The total chloro-triazine period mean concentrations for the two CWS are below the proposed chronic DWLOC for all population subgroups in Table 12 (p. 75).

Table 3

Time-Weighted Total Chloro-Triazine Period Means (1993-1998) Calculated for CWSs Identified in EPA Table 10 (p.71)

CWS	PLEX (ppb)	Period Mean VMS (ppb)	Period Mean ARP(ppb)*	Period Mean
Shipman	6.72	8.42	5.63	
Hettick	6.78	10.45	-	

*ARP program sampled 1995-1997

11. EPA identified eleven CWSs with total chloro-triazine seasonal (3-month) mean concentrations exceeding the chronic DWLOC in Table 11 (p.72-74). The time-weighted total chloro-triazine period mean concentrations for the eleven CWSs from the PLEX, VMP, and ARP databases are shown in the Table 4 below. The total chloro-triazine period means for the eleven CWS are below the DWLOC for all eight population subgroups in Table 12 (p.75).

Table 4

Total Chloro-Triazine Period Means from PLEX and VMS (1993-98) databases and ARP (1995-97) databases Calculated for the eleven CWS identified by EPA in Table 11 (p.72-74)

CWS	Period Mean** PLEX (ppb)	Period Mean VMS (ppb)	Period Mean ARP (ppb)*
Shipman, IL	6.72	8.42	5.63
Hettick, IL	6.78	10.45	-
Salem, IL	1.94	7.05	1.38
Palmyra-Modesto	4.09	6.42	2.48
Hillsboro, IL	3.71	2.77	-
Gillespie, IL	4.17	-	4.73
Farina, IL	4.28	6.06	4.29
Kinmundy, IL	1.93	3.75	-
ADGPTV, IL	3.23	4.56	-
Scottsburg, IN	0.56	2.21	3.02
Holland, IN	2.68	1.36	3.22

*ARP program sampled 1995-1997
** Not all of the CWS monitoring began in 1993

12. EPA identified ten CWSs with total chloro-triazine annual means approaching, equal to, or above the chronic DWLOC of 12.5 ppb in Table 13 (p.76). The time-weighted period mean concentrations for the ten CWSs from the PLEX, VMP, and ARP databases are shown below in Table 5. The time-weighted total chloro-triazine concentrations are below all DWLOC for the eight population subgroups in Table 12 (p.75).

Table 5

Time-Weighted Total Chloro-Triazine Period Means: PLEX and VMS,(1993-1998) and ARP (1995-1997) Calculated For CWS Identified in EPA Table 13 (p.76)

CWS	Period Mean PLEX (ppb)	Period Mean VMS (ppb)	Period Mean ARP (ppb)
Shipman, IL	6.72	8.42	5.63
Hettick, IL	6.78	10.45	-
Salem, IL	1.94	7.05	1.38
Palmyra-Modesto	4.09	6.42	2.48
Hillsboro, IL	3.71	2.77	-
Gillespie, IL	4.17	-	4.73
Sardinia, OH	4.83	-	-
Drexel, MO	4.86	1.67	-
Dearborn, MO	4.10	1.06	-
Carlinville, IL	1.58	1.54	-

13. EPA identified 24 CWS with seasonal (3-month) total chloro-triazine means approaching, equal to, or above the chronic DWLOC of 12.5 ppb in Table 14 (p. 77-80). The time-weighted period means for the 24 CWS from the VMP, PLEX, and ARP databases are shown in Table 6. The total chloro-triazine period mean concentrations for the 24 CWS are below the DWLOC for all 8 population subgroups.

Table 6

Time –Weighted Total Chloro-Triazine Period Means from PLEX and VMS databases (1993-1998) and ARP database (1995-97) Calculated for CWS Identified in EPA Table 14 (p.77-80)

CWS	Period Mean PLEX (ppb)	Period Mean VMS (ppb)	Period Mean ARP (ppb)
Shipman, IL	6.72	8.42	5.63
Hettick, IL	6.78	10.45	-
Salem, IL	1.94	7.05	1.38
Palmyra-Modesto	4.09	6.42	2.48
Hillsboro, IL	3.71	2.77	-
Gillespie, IL	4.17	-	4.73
White Hall, IL	3.35	4.23	6.00
Farina, IL	4.28	6.06	4.29
Kinmundy, IL	1.93	3.75	-
ADGPTV, IL	3.23	4.56	-
Scottsburg, IN	0.56	2.21	3.02
Holland, IN	2.68	1.36	3.22
Sardinia, OH	4.83	-	-
Drexel, MO	4.86	1.67	-
Dearborn, MO	4.10	1.06	-
Chariton, IA	1.84	2.48	2.40
Iberville, LA	3.87	3.91	-
Bucklin, MO	1.81	4.45	-
Centralia, IL	2.18	3.72	2.46
Wayne City, IL	1.84	2.24	-
Batesville, IN	2.01	-	4.28
Vandalia, MO	2.21	2.78	2.71
Flora, IL	1.75	-	2.76
Sorento, IL	3.84	-	3.22
West Salem, IL	3.72	-	3.85
North Vernon, IN	1.21	-	5.62
Carlinville, IL	2.69	2.19	2.82

14. Two CWS have the incorrect State identified in the text on pg. 80. Iberville is in Louisiana and Chariton is in Iowa.

15. EPA used time weighting procedures in calculating annual total chloro-triazine mean concentrations for the CWS in VMS from 1994-1998. EPA needs to revise Figures C-7 thru C-11 in Appendix C noted on page 71 using time weighted total chloro-triazine annual mean concentrations. Figures D-4 to D-6 (Appendix D) developed from the ARP database should be revised also using time-weighted total chloro-triazine annual mean concentrations.

16. EPA did not use time-weighting procedures in calculating seasonal total chloro-triazine mean concentrations for the CWSs in VMS from 1994-1998. Therefore, Figures C-12 thru C-16 in Appendix C noted on page 71 should be revised using time-weighted total chloro-triazine seasonal mean concentrations. Figures D-7 to D-9 (Appendix D) developed from the ARP database should be revised using time- weighted total chloro-triazine seasonal mean concentrations.

In the remaining edits, Syngenta is recommending that certain words, phrases, or numbers be changed to reflect the right finding from a methodological standpoint only. It should not be misconstrued that Syngenta proposes these changes as the correct conclusion from the standpoint of a valid risk assessment.

17. Page 74, line 1; 11 CWS should be changed to 6 CWS. On line 2 the number of CWS changed from 11 to 6. On line 2 the CWS percentage changed from 0.06% to 0.03%. On line 3 the number of CWS changed from 11 to 6. Also on line 3 the population served is changed from approximately 26,500 people to 19,190.

18. Page 74 line 3, change four to three.

19. Page 74 line 5, remove Palmyra-Modesto from the sentence.

20. Page 74 line 5, should strike “same four CWS” and insert “Two of the three are the same CWS”.

21. Page 74 line 7, strike “Table 9” and replace with “Table 10”.

22. Page 74 strike line 7, starting at “…nine of these CWS…” and replace with six of these CWS.

23. Page 74 line 8, strike “Nine of these CWS located in Illinois, two in Indiana and one in Missouri” and replace with “Six CWS located in Illinois.”

24. Page 74 line 8, strike “9 CWS” and replace with “6 CWS”.

25. Page 74 line 8, strike “4 sold water” and replace with “2 sold water”.

26. Page 74 line 8, strike “20” and replace with “10”.

27. Page 74 line 9, strike “additional 23,000 people” and replace with “5,705 people”.

28. Page 74 line 10, strike “11 CWS” and replace with “6 CWS”.

29. Page 74 line 10, strike “approximately 59,500 people” and replace with “20,790 people”.

30. Page 74 line 12, strike “for these 11 CWS” and replace with “ 6 CWS”.

31. Page 74 paragraph 1, line 1, strike “62 ppb” and replace with “26.53 ppb”. EPA calculated the Salem, IL seasonal total chloro-triazine mean concentration by using the single sample data point in June of 1993. A more accurate estimation of seasonal total chloro-triazine mean concentration is based on a 3-month time weighted average (June-August 1993) from the VMS database. This time weighted seasonal total chloro-triazine mean concentration for 1993 is 26.53 ppb.

32. Page 74 paragraph 2, line 3, strike “for adult females as well as”. Since the total chloro-triazine seasonal mean is 26.53 ppb it does not, exceed the EPA proposed DWLOC for females 13-50 as listed by EPA in Table 9.

33. Page 74 line 3, strike “other”. The seasonal total chloro-triazine mean concentrations for all CWS were less than the chronic DWLOC for all adult male and female population subgroups in EPA Table 9.

34. Page 75, first paragraph, line 1, strike “11 CWS” and replace with “6 CWS”.

35. Page 75, first paragraph, line 2, strike “Hillsboro… Kinmundy… ADGPTV…Holland… Scottsburg”. This is based upon the calculated time weighted total chloro-triazine seasonal means.

36. Page 76, last line, strike “10 CWS” and replace with “7 CWS”.

37. Page 76, last line, strike “8 in addition” and replace with “5 in addition”.

38. Page 77, paragraph 1, lines 3-5, strike “Carlinville, IL, Gillespie, IL and Hillsboro, IL”. Based upon calculated of time weighted annual total chloro-triazine mean concentrations, the 3 CWS are below 12.5 ppb.

39. Page 77, paragraph 1, lines 5 to 12, strike the following: “The CWS at Gillespie…through…Taylor Springs (serving 650 people).” The time weighted annual total chloro-triazine mean concentrations of Gillespie and Hillsboro

(and CWS that purchase from them) are below the chronic DWLOC of 12.5 ppb.

40. Page 77, paragraph 2, line 2, strike “ARP approaching, equal to” and replace with “ARP equal to”.

41. Page 80, paragraph 1, line 1, strike “25 CWS” and replace with “11 CWS”.

42. Page 80, paragraph 1, line 1, strike “(13 in addition to the 11 CWS identified above in Table 11)”. This is no longer a correct phrase. On page 80, paragraph 1, lines 4-7, strike “Kinmundy, Carlinville, West Salem, Flora, Sorento, Chariton, Centralia, Wayne City, Batesville, Holland, North Vernon, Bucklin and Vandalia.” Time weighted total chloro-triazine seasonal means for these CWS do not exceed 12.5 ppb.

43. Page 80, paragraph 1, line 10, strike “25 CWS” and replace with “11 CWS”.

44. Page 80, paragraph 1, line 10, strike “approximately 140,000” and replace with “approximately 61,034”.

45. Page 80, paragraph 2, line 3, strike “atrazine use (75,359,918 people)” and replace with “atrazine use (64,943,203 people)”. Population for CWS with data from Table 4.2-1 on page 289 of 2290, PLEX Update V, (1993-1998).

46. Page 82, paragraph 2, line 4, strike “8,548 CWS using surface water” and replace with “3,670 CWS using surface water. CWS on surface water with data from Table 4.2-1 on page 289 of 2290 from PLEX Update V, (1993-1998).

47. |Page 82, paragraph 2, line 5, strike “atrazine residues” and replace with “total chloro-triazine concentrations”.

48. Page 82, paragraph 2, line 7, strike “atrazine residues” and replace with “total chloro-triazine concentrations”.

49. EPA should globally edit to ensure that atrazine residues refer to atrazine concentrations and not to total chloro-triazine concentrations and that total chloro-triazines are not referred to a atrazine residues.

50. Page 82, paragraph 2, line 8, strike “62 ppb in 1993” and replace with “26.53 ppb in 1993”. EPA calculated the Salem, IL seasonal total chloro-triazine mean concentration by using the single sample data point of 61.61 ppb in June of 1993. A more accurate estimation of seasonal total chloro-triazine mean concentration is based on a 3-month time weighted average (June – August 1993) from the VMS database. This time-weighted maximum seasonal total chloro-triazine mean concentration is 26.53 ppb in 1993.

51. Page 82, paragraph 2, line 11, strike “adult females”.

52. Page 82, paragraph 2, line 11, strike “All other CWS” and replace with “All CWS”.

53. Page 82, paragraph 2, line 15, strike “25 CWS” and replace with “11 CWS”.

54. Page 82, paragraph 2, line 16 to 18, strike “Kinmundy…Carlinville…West Salem …Flora… Sorento… Chariton… Centralia… Wayne City… Batesville… Holland…North Vernon… Bucklin… Vandalia”. Time weighted total chloro-triazine seasonal means for these CWS do not exceed 12.5 ppb.

55. Page 83, paragraph 3, line 6, EPA states that the PLEX database is not comprehensive. It is very unlikely that unmonitored CWSs and CWSs waived from atrazine monitoring requirements would have detections of atrazine approaching the MCL (3.0 ppb) much less the 12.5 ppb.

56. Page 84, paragraph 2, lines 9 and 11, strike “seasonal mean concentrations of atrazine residues” and replace with “seasonal mean concentrations of total chloro-triazine residues”.

57. Page 84, paragraph 3, line 2, strike “(73,856,519)” and replace with “(55,440,483)”. Population on groundwater with data from Table 4.2-1 on page 289 of 2290 from PLEX Update V, (1993-1998).

58. Page 113, paragraph 2, line 11, strike “a seasonal mean concentration of 62 ppb” and replace with 26.53 ppb”. EPA calculated the Salem, IL seasonal total chloro-triazine mean concentration by using the single sample data point of 61.61 ppb in June of 1993. A more accurate estimation of seasonal total chloro-triazine mean concentration is based on a 3-month time-weighted average (June – August 1993) from the VMS database. This time-weighted seasonal total chloro-triazine mean concentration is 26.53 ppb in 1993.

59. Page 113, paragraph 2, line 12, strike “ level of concern for adults and children” and replace with “level of concern for children”. The total chloro-triazine seasonal mean concentration of 26.53 ppb in 1993 does not exceed the chronic DWLOC of 60 ppb for the female population subgroup and 68 ppb for all male subgroups.

60. Page 113: Replace “24 CWS” with “11 CWS” wherever it appears on Page 113. Based upon time weighted total chloro-triazine seasonal means, eleven of the 24 CWS identified by EPA in Table 14 have levels above 12.5 ppb.

61. Page 113, paragraph 4, line 2, strike “variously 0.11 %” and replace with “variously 0.05 %”.

62. Page 113, paragraph 4, line 3, strike “blend, 0.5% of” and replace with “blend, 0.23% of”.

63. Page 113, paragraph 4, line 3, strike “and 0.65% of” and replace with “and 0.3% of”.

64. Page 114, paragraph 3, lines 5,9 and 10, strike “of atrazine residues” and replace with “of total chloro-triazine concentrations”.

65. Page 114, paragraph 4, line 7, strike “ (3-month) average concentration of 62 ppb” and replace with “ (3-month) average concentration of 38.86 ppb”. Based upon time weighted total chloro-triazine seasonal means, the maximum mean concentration for the 24 CWS in EPA Table 14 is 38.86 ppb in 1994. The 62 ppb listed by EPA is based upon a single sample in June of 1993 does not represent the three-month seasonal exposure concentration for that CWS in 1993.

66. Page 117, paragraph 2, line 1, strike “25 CWS” and replace with 14 CWS”.

67. Page 117, paragraph 2, line 2, strike “atrazine residues” and replace with “total chloro-triazine concentrations”.

68. Page 117, paragraph 2, line 6: The Shipman water treatment plant was closed in 1998. They stopped using their surface source water and are now purchasing finished drinking water from Illinois American Company (Alton, IL) whose source water is the Mississippi River.

69. Please identify the database used with each CWS listed in Appendix E. It appears the PLEX database was used.

70. Page 70, first paragraph, EPA indicates there are CWSs with individual annual maximum sample concentrations at or above the chronic DWLOC of 18 ppb. EPA is concerned that these CWSs pose uncertainty in the risk assessment since there are not sufficient data to assess total chloro-triazine seasonal mean concentrations for comparison to the DWLOC for the eight population subgroups. EPA identifies in Appendix E eighteen CWSs as an example for EPA Office of Water to review in assessing potential exceedance of the DWLOC. Syngenta has calculated time-weighted TCT seasonal and annual mean concentrations from the PLEX, VMS, and ARP databases for the eighteen CWSs. The seasonal and annual means were calculated for the eighteen CWSs listed in Appendix E when there were data for the year listed by EPA and all other years for each of the eighteen CWSs during the six-year (1993-1998) period. The results of the time-weighted seasonal and annual TCT mean concentrations for the eighteen CWSs are shown in the following table.

COMPARISON OF ANNUAL MAXIMUM (SINGLE SAMPLE) TOTAL CHLOROTRIAZINE CONCENTRATIONS BY EPA-OPP IN APPENDIX E TO ANNUAL MEANS IN PLEX UPDATE V, ATRAZINE VOLUNTARY MONITORING PROGRAM AND THE ACETOCHLOR REGISTRATION PARTNERSHIP PROGRAM

		Total Chlorotriazine Max Conc (ppb)	Total Chlorotriazine Annual Mean (ppb)			Total Chlorotriazine Seasonal Mean (ppb)	
CWS	**Year**	**Appendix E**	**PLEX**	**VMS**	**ARP**	**VMS**	**ARP**
McClure, OH	1993	-	-	-	-	-	-
McClure, OH	1994	-	0.98	-	-	-	-
McClure, OH	1995	-	-	-	2.13	-	6.20
McClure, OH	1996	-	0.83	-	2.25	-	5.68
McClure, OH	1997	-	4.89	-	2.16	-	7.13
McClure, OH	1998	20.1	1.91	-	1.47	-	4.06
Waverly, IL	1993	-	1.03	1.32	-	2.11	-
Waverly, IL	1994	-	3.66	-	-	-	-
Waverly, IL	1995	-	2.77	-	-	-	-
Waverly, IL	1996	-	3.28	-	-	-	-
Waverly, IL	1997	-	1.51	-	-	-	-
Waverly, IL	1998	-	2.92	-	-	-	-
Newark, OH	1993	-	-	-	-	-	-
Newark, OH	1994	-	0.43	-	-	-	-
Newark, OH	1995	-	2.60	-	-	-	-
Newark, OH	1996	-	0.78	-	-	-	-
Newark, OH	1997	29.7	2.88	-	-	-	-
Newark, OH	1998	-	1.02	-	-	-	-
Delaware, OH	1993	-	-	-	-	-	-
Delaware, OH	1994	-	0.80	-	-	-	-
Delaware, OH	1995	-	-	-	-	-	-
Delaware, OH	1996	-	5.13	-	-	-	-
Delaware, OH	1997	19.8	5.33	-	-	-	-
Delaware, OH	1998	-	1.82	-	-	-	-
Lake of the Woods, OH	1993	-	-	-	-	-	-
Lake of the Woods, OH	1994	-	-	-	-	-	-
Lake of the Woods, OH	1995	-	-	-	-	-	-
Lake of the Woods, OH	1996	-	5.35	-	-	-	-
Lake of the Woods, OH	1997	18.1	6.02	-	-	-	-
Lake of the Woods, OH	1998	-	3.02	-	-	-	-

CWS	Year	Total Chlorotriazine Max Conc (ppb)	Total Chlorotriazine Annual Mean (ppb)			Total Chlorotriazine Seasonal Mean (ppb)	
		Appendix E	PLEX	VMS	ARP	VMS	ARP
Napoleon, OH	1993	-	-	-	-	-	-
Napoleon, OH	1994	-	2.08	-	-	-	-
Napoleon, OH	1995	-	3.42	-	-	-	-
Napoleon, OH	1996	-	3.52	-	-	-	-
Napoleon, OH	1997	17.9	4.22	-	-	-	-
Napoleon, OH	1998	-	1.97	-	-	-	-
Sardinia, OH	1993	-	-	-	-	-	-
Sardinia, OH	1994	-	0.87	-	-	-	-
Sardinia, OH	1995	-	-	-	-	-	-
Sardinia, OH	1996	55.2	14.83	-	-	-	-
Sardinia, OH	1997	-	2.50	-	-	-	-
Sardinia, OH	1998	-	1.12	-	-	-	-
Louisville, IL	1993	-	3.14	-	-	-	-
Louisville, IL	1994	-	5.33	-	-	-	-
Louisville, IL	1995	-	2.84	-	-	-	-
Louisville, IL	1996	24.3	5.75	-	-	-	-
Louisville, IL	1997	-	2.84	-	-	-	-
Louisville, IL	1998	-	-	-	-	-	-
Osawatomie, KS	1993	-	-	-	-	-	-
Osawatomie, KS	1994	-	-	-	-	-	-
Osawatomie, KS	1995	-	1.84	-	-	-	-
Osawatomie, KS	1996	17.3	6.30	-	-	-	-
Osawatomie, KS	1997	-	3.54	-	-	-	-
Osawatomie, KS	1998	-	1.08	-	-	-	-
Adrian, MO	1993	-	-	-	-	-	-
Adrian, MO	1994	22.9	7.80	-	-	-	-
Adrian, MO	1995	-	0.63	0.64	-	0.50	-
Adrian, MO	1996	-	0.54	0.52	-	0.58	-
Adrian, MO	1997	-	0.54	0.47	-	0.34	-
Adrian, MO	1998	-	1.97	1.59	-	3.48	-
Springfield, IL	1993	-	1.28	-	-	-	-
Springfield, IL	1994	20.1	4.71	-	-	-	-
Springfield, IL	1995	-	1.48	1.57	1.98	1.44	2.49
Springfield, IL	1996	-	1.92	1.49	1.79	1.04	1.45
Springfield, IL	1997	-	0.95	1.18	1.25	0.94	1.13
Springfield, IL	1998	-	1.01	1.69	1.60	1.78	2.13

CWS	Year	Total Chlorotriazine Max Conc (ppb)	Total Chlorotriazine Annual Mean (ppb)			Total Chlorotriazine Seasonal Mean (ppb)	
		Appendix E	PLEX	VMS	ARP	VMS	ARP
Paris, IL	1993	-	2.28	-	-	-	-
Paris, IL	1994	18.7	9.15	-	-	-	-
Paris, IL	1995	-	0.77	-	0.95	-	0.60
Paris, IL	1996	-	1.08	-	2.96	-	6.72
Paris, IL	1997	-	0.67	-	1.69	-	1.86
Paris, IL	1998	-	0.74	-	3.10	-	9.70
Clay City, IL	1993	-	2.74	-	-	-	-
Clay City, IL	1994	18.7	6.98	-	-	-	-
Clay City, IL	1995	-	1.36	-	1.34	-	2.29
Clay City, IL	1996	-	0.44	-	0.46	-	0.46
Clay City, IL	1997	-	1.35	-	1.56	-	1.98
Clay City, IL	1998	-	0.56	-	0.81	-	0.61
Louisville, IL	1993	-	3.14	-	-	-	-
Louisville, IL	1994	18.7	5.33	-	-	-	-
Louisville, IL	1995	-	2.84	-	-	-	-
Louisville, IL	1996	-	5.75	-	-	-	-
Louisville, IL	1997	-	2.84	-	-	-	-
Louisville, IL	1998	-	-	-	-	-	-
Butler, MO	1993	-	-	-	-	-	-
Butler, MO	1994	18.7	4.98	-	-	-	-
Butler, MO	1995	-	0.54	0.72	0.44	1.20	0.26
Butler, MO	1996	-	3.01	0.97	1.18	2.30	2.98
Butler, MO	1997	-	1.10	1.03	1.07	1.59	1.56
Butler, MO	1998	-	0.92	0.84	0.69	1.64	1.30
Vermont, IL	1993	-	0.90	-	-	-	-
Vermont, IL	1994	17.3	10.28	-	-	-	-
Vermont, IL	1995	-	2.36	-	-	-	-
Vermont, IL	1996	-	1.20	1.34	-	1.62	-
Vermont, IL	1997	-	0.48	0.75	-	0.44	-
Vermont, IL	1998	-	0.58	0.53	-	0.74	-
Three Rivers, IN	1993	20.1	3.21	-	-	-	-
Three Rivers, IN	1994	-	0.58	-	-	-	-
Three Rivers, IN	1995	-	1.52	-	-	-	-
Three Rivers, IN	1996	-	0.93	0.57	-	1.20	-
Three Rivers, IN	1997	-	0.67	1.20	-	3.13	-
Three Rivers, IN	1998	-	2.54	0.77	-	2.34	-

With the exception of Sardinia in 1996, the other 17 CWSs identified by EPA in Appendix E had total chloro-triazine annual means below 12.5 ppb from the PLEX database. The maximum PLEX total chloro-triazine annual mean for the remaining CWSs was 10.28 ppb in 1994. Nine of the 18 CWS listed in Appendix E also had one year or more of VMS or ARP monitoring data. Time-weighted annual and seasonal total chloro-triazine means calculated from VMS and ARP did not exceed 8 ppb for the nine CWS.

74. Page 16, Paragraph 2: The value of 61.6 ppb, stated as the maximum seasonal (average of highest 3 months) mean for all CWSs, is a single sample date concentration, and it is not scientifically valid to report this value as a seasonal mean. A seasonal mean based on a three month period in 1993 (June-August) was 26.53 ppb as shown in Syngenta Table 1. The highest three month seasonal mean for all CWSs occurred in 1994 at the same CWS and was 38.86 ppb (Table 1). This maximum seasonal mean concentration is below the EPA proposed DWLOC of 54 ppb (adult females in EPA Table 9) and 60 ppb (adult female in EPA Table 12).

75. Page 16, Paragraph 4: The number of CWSs with seasonal and annual means above 12.5 ppb is 14 rather than 24 identified by EPA.

76. None of the period means calculated from either PLEX, VMS, or ARP separately or as a composite database for the 3,670 CWSs on surface water were above 12.50 ppb.

Summary comments

The preliminary conservative deterministic drinking water risk assessment for CWSs on surface water shows the exposure above 12.5 ppb is localized to specific CWSs and is not national or even regional in scope. Out of the 3,670 CWSs assessed in the 21 major use states, 14 CWSs were identified as having potential for annual or seasonal residues above 12.5 ppb. These CWS are associated with relatively small watersheds and reservoirs.

The identification of CWSs for future probabilistic risk assessment should be based only on those CWSs with annual or period total chloro-triazine (TCT) means greater than the level of comparison for chronic exposure. CWSs identified in the conservative deterministic assessment (including 1000 fold safety factor) as less than the level of comparison should be removed from further consideration.

The calculation of seasonal means from the Syngenta VMS and ARP CWS databases should be time-weighted to obtain a more accurate estimation of exposure. EPA used the time-weighting method to calculate annual means from these databases and should also apply this method to the calculation of seasonal means. The seasonal and annual time-weighting mean procedure can result in concentrations higher or lower than those obtained by the arithmetic mean calculation.

EPA identified two of 3,670 CWSs with monitoring data (1993-1998) on surface water with annual TCT mean concentrations (18.9 ppb and 18.6 ppb) greater than 18 ppb in the 21 major use states (Table 10) in 1996 for both CWSs.

EPA identified eleven of the 3,670 CWSs with monitoring data (1993-1998) on surface water with seasonal TCT mean concentrations greater than 18 ppb in the 21 major use states (Table 11). However, when the seasonal means are calculated in a time-weighted manner, six CWSs exceed 18 ppb.

EPA identified ten of the 3,670 CWSs with monitoring data on surface water with annual TCT mean concentrations greater than 12.5 ppb in the 21 major use states (Table 13). However, three CWSs do not exceed 12.5 ppb and should be deleted. Three of the seven CWSs had residues greater than 12.5 ppb in 1996 and four of the seven CWSs exceeded in 1994.

EPA identified 24 of the 3,670 CWSs with monitoring data on surface water with TCT seasonal mean concentrations greater than 12.5 ppb in the 21 major use states (Table 14). However, four CWSs were less than the 12.5 ppb. When the seasonal means were calculated in a time-weighted manner, nine additional CWSs were less than 12.5 ppb. Thus, thirteen CWSs should be removed. Eleven of the 3,670 CWS had TCT seasonal mean concentrations greater than 12.5 ppb. Seven of the eleven CWS exceeded 12.5 ppb in only one year over the 6-year monitoring period (1993-1998). Two of the eleven CWSs had an exceedance in two of the 6-year monitoring period. Another two of the eleven CWSs had an exceedance in three of the 6-year monitoring period. Nine of the eleven CWSs had an exceedance in or prior to 1996. There was one CWS with a seasonal mean above 12.5 ppb in 1997 and one in 1998.

EPA identified a maximum seasonal TCT concentration of 61.61 ppb at one CWS in 1993. This concentration is based on a single sample in June of 1993. The time-weighted seasonal mean based upon a three month interval (June, July, August) was 26.53 ppb in 1993. Based upon calculation of time-weighted seasonal means for the 28 CWSs identified by EPA in Tables 10-14, the highest seasonal mean is now 38.86 ppb. It occurred at the same CWS, but in the year 1994.

Appendix 1 of Attachment 4

PLEX Update VI: Calculation of Total Chloro-Triazine Concentrations from Syngenta's Atrazine Voluntary Monitoring Program and the Atrazine Population Linked Exposure Assessment

Atrazine Voluntary Monitoring Program with Selected Community Water Systems (CWSs) in U.S.

Total chloro-triazine (TCT) individual sample concentrations were calculated from the individual atrazine sample date concentrations through the use of four quarterly regression equations developed by Syngenta (TCT = total chloro-triazine, x = atrazine). Due to the unequal sample frequency schedule with the CWS, annual TCT means were calculated with a time-weighting procedure. The individual TCT concentrations were averaged to obtain a single monthly TCT mean. Monthly TCT means were then arithmetically averaged to obtain the TCT annual means for each CWS.

January to March samples: TCT = 1.813 x + 0.145

April to June samples: TCT = 1.311 x + 0.303

July to September samples: TCT = 1.594 x + 0.360

October to December samples: TCT = 1.803 x + 0.103

<u>Population Linked Drinking Water Exposure Assessment (PLEX) with Community Water Systems (CWS) on Surface Water in 31 Atrazine Major Use States</u>

Total chloro-triazine (TCT) individual sample concentrations were calculated from the individual atrazine sample date concentrations for each CWS through the use of four quarterly regression equations (shown above) developed by Syngenta (TCT = total chloro-triazine, x = atrazine). To account for any unequal sample frequencies by quarter with the CWS, annual TCT means were calculated with a time-weighting procedure. The individual TCT concentrations within each quarter were averaged to obtain a single quarterly TCT mean. The quarterly TCT means were then arithmetically averaged to obtain the TCT annual means for each CWS.

Attachment 5

Syngenta's Comments on EPA's January 19, 2001 “Atrazine: HED’s Revised Preliminary Human Health Risk Assessment for the Reregistration Eligibility Decision” and the January 18, 2001 "Occupational and Residential Exposure Assessment and Recommendations for the Reregistration Eligibility Decision Document "

Overall Comments on: Occupational and Residential Exposure Assessment and Recommendations for the Reregistration Eligibility Decision Document for Atrazine

Several of the exposure scenarios in the revised preliminary risk assessment have been modified as a result of the new information on agricultural practices. Additionally, with our comments on the occupational and residential risk assessment error correction Syngenta is submitting a paper supporting our position on hand to mouth exposure from turf treated with atrazine (Appendix 1 of Attachment 5). Also, Syngenta is submitting two document entitled “Atrazine Impregnation on Bulk Dry Fertilizer and Mixing Atrazine with Bulk Liquid Fertilizer: A Description of the Process and Occupational Risk Assessment” (Appendix 3 of Attachment 5) and “Atrazine Use in Southern Turf: Additional Information for Residential Turf Risk Assessments” (Appendix 2).

Summaries of the EPA estimates of the Occupational and Residential Exposure Risks should be revised based on the information provided in the Detailed Comments below.

Detailed Comments on: Revised Preliminary Human Health Risk Assessment for the Reregistration Eligibility Decision for Atrazine

1. Page 19, 2nd Paragraph: Please clarify that the estimated MOEs of 390 and 660 are for adults and children playing on lawns treated with <u>liquid</u> formulations. The estimated MOEs are 2,400 and 4,000 for adults and children playing on <u>granular</u> treated lawns, and they are acceptable. Also, note that these MOEs are based on exposure to the treated turf <u>on the day of application</u>, not the day after treatment as stated incorrectly in the revised assessment.

2. Page 19, 2nd Paragraph: The screening level model used to assess non-dietary ingestion through sucking of wet fingers has not been through a formal scientific evaluation process. As a result, the accuracy of this model, and thus the perceived risks are speculative at best. See Appendix 1 of this Attachment for the Syngenta position on this issue.

3. Page 19, 2nd Paragraph, Line 10: Taking into account turf morphology and granule characteristics, the feasibility of a child foraging and ingesting 0.2 to 0.4 grams of granules from a lawn is doubtful. Syngenta is submitting with this response a document (Appendix 2 to this Attachment) describing the four southern turf varieties labeled for atrazine treatment and details relating to the size distribution of atrazine-impregnated fertilizer granules. Information in this report demonstrates the implausibility of the granule ingestion scenario.

4. Page 19, 4th Paragraph, Line 5: Syngenta is submitting a document (Appendix 3 to this Attachment) that describes the fertilizer impregnation and the liquid/liquid fertilizer mixing processes so that the exposure to workers mixing liquid atrazine with liquid fertilizers can be better characterized.

5. Page 20, 3rd Paragraph: The use scenarios where the intermediate-term MOE's are less than 100 should be not be assessed for intermediate-term risks. These are all use patterns which occur less than 30 days per year. It should also be noted that some scenarios, such as mixing and loading with open-pour 2.5 gallon jugs for aerial applications of 1,200 acres, is physically impossible.

6. Page 25, 1st Paragraph, Line 9: Syngenta agrees that the probabilistic approach to residential nondietary risk assessment would provide a more refined and realistic assessment of potential risks. However, since there is currently a lack of data for these ingestion scenarios on which to base a probablisitic risk assessment, the reliability of such an assessment is questionable. In addition, we request that EPA establish policies on the evaluation and interpretation of probablisitic non-dietary risk assessments.

7. Page 25, 3rd Paragraph, Line 11: The impregnation of dry bulk fertilizer does not occur on-farm; this is a process which is done only in a commercial fertilizer facility utilizing specialized equipment. This information is detailed in the submission entitled: "Atrazine Impregnation on Bulk Dry Fertilizer and Mixing Atrazine with Bulk Liquid Fertilizer: A Description of the Process and Occupational Risk Assessment" (Appendix 3 of this Attachment).

Detailed Comments on: Occupational and Residential Exposure Assessment and Recommendations for the Reregistration Eligibility Decision Document for Atrazine

1. Page 6, 1st Paragraph, Line 7: The arbitrary aggregation of all potential activities that a person may do in an 8 hour period on a pesticide treated lawn (4 hrs of golf + mowing 2 hrs + 2 hrs of high-contact activity) immediately following an application is unrealistic. There are no data to form a basis for such a risk assessment nor is this type of risk manipulation sanctioned in the EPA Residential SOPs.

2. Page 6, 2nd Paragraph: EPA mentions that there are several application methods that homeowners can use to apply atrazine to their yards; however, only the one method which results in a risk below the required MOE of 1000 is cited. To provide an unbiased summary, the other scenarios (spot treatment with hand pump and entire treatment with granular push spreader) should also be cited for comparison purposes.

3. Page 6, 3rd Paragraph: This wet/sticky hand scenario has not been adequately peer reviewed and should not be included in any assessment until properly evaluated and the data availability and needs are understood. There are no data to presume that results from a corn dislodgeable foliar residue study in any way represent transfer of pesticide residues from turf to a child's moist hand, so the corn DFR value should not be used to justify the 5% transfer factor. The default 5% transfer rate should in fact be replaced by the actual turf transferable residue data for atrazine adjusted for wet hands. As seen in the Clothier (2000) study, a 3-fold increase in wet versus dry hand transfer should be used until more relevant data are developed for this scenario in turf.

4. Page 6: 5th Paragraph: The label that permits professional application to "corn in the home garden" is an outdated label (accepted by EPA 4/18/89),. which has been replaced by the label (accepted 10/28/96) which does not allow this application scenario.

5. Page 7: 2nd Paragraph, Line 2: According to discussions on March 21, 2001, between the ORETF and representatives from EPA, it appears that the review of the ORETF mixer/loader/applicator monitoring data is complete and this data are viewed as high confidence. Therefore the statement "these data sets have not yet been fully compared, and therefore there are significant uncertainties in the risk estimates" is incorrect and should be removed.

6. Page 7, 2nd Paragraph, Line 5: As this section relates to uncertainties in the risk assessments, it should be noted that there is a large amount of uncertainty in the oral ingestion scenarios and that these models are based on very conservative estimates of time and activity parameters that have not been validated.

7. Page 7, 5th Paragraph, Line 2: In order to reduce potential exposure, Syngenta agrees with the EPA's recommendation to require label language to prohibit application of the granular formulation by hand or with hand-held devices and to strengthen wording to prevent accidental ingestion by children. The need to water-in following application should also be emphasized on the labels; incidentally, these are not Syngenta labels.

8. Page 14, "Methods and Types of Equipment used for Mixing, Loading, and Application", Line 5: The confusion regarding the terminology "truck-mounted sprayer exposure" is unclear. The typical definition of this is a groundboom sprayer. The data in PHED clearly covers this type of use pattern.

9. Page 27, 4th bullet, first point: If aerial short-term risks are assessed using 1,200 acres sprayed per day, no intermediate-term risk assessment (greater than 30 days/year) should be calculated. The EPA scenario that one aerial applicator and loader would treat a minimum of 36,000 acres (1,200 acres per day x 30 days) of corn per year is implausible. Doane Marketing data show that in 1999 and 2000, only 4 states out of 16 that used atrazine had more than 50,000 acres of corn aerially applied with atrazine during a one year period. It is not realistic that one individual person applied atrazine over all the aerially-treated corn acres within one state, so the intermediate-term risk assessment using 1,200 acres/day needs to either be removed or the acreage adjusted to reflect real-word practices. See comment 15 below.

10. Page 28, 3rd item: The assumption that 960 tons of bulk dry fertilizer is impregnated with atrazine per day is incorrect. The correct assumption would be 200 tons of fertilizer per day. Data supporting this assertion is found in Appendix 3 of this Attachment. The exposure assessment should be revised accordingly.

11. Page 28, 4th item: It is unclear how EPA arrived at a range of 143 to 500 acres treated per day with granular fertilizer. Information from equipment manufacturers indicate that 120 acres/day is a more realistic number. This is based on a typical truck capacity of 10 tons (20,000 lbs) with an application rate of 500 lb fertilizer per acre. With each truck load capable of treating 40 acres, a typical day would consist of filling the truck 3 times for a total of 120 acres/day. Acreage treated is limited by truck/hopper capacity, swath width, surface conditions, and fertilizer application rate.

12. Page 28, 5th item: The default assumption that professional LCOs spray <u>5</u> acres per day is in error and should be replaced with an assumption of <u>3</u> acres per day as has been previously used by the Agency during the RED process and supported by the ORETF data. The data provided by ORETF supported <u>2.5</u> acres treated per day by LCOs as a high-end estimate, not 5 acres. For an upper-bound estimate of area treated and to be consistent with previous Agency risk assessments for other turf products, the default assumption of 3 acres per day should be used.

13. Page 28, 2nd bullet point, Line 4: PHED data, ARTF data and ORETF data as well as proprietary studies show that the protection factor of a layer of clothing is much greater than the 50% used by EPA. Data from these sources show that clothing provides approximately an 80% protection factor. The EPA response to Syngenta's 30-Day Comments indicates that the Agency is in the process of considering data on this issues as part of ongoing NAFTA harmonization. For transparency please provide a list of the data under evaluation.

14. Page 29, 2nd Paragraph: The parameters used in the impregnation of dry bulk fertilizer scenario by EPA are incorrect. This is a closed system process that occurs only in commercial fertilizer plants. A description of the process along with the risk assessment can be found in Appendix 3 of this Attachment. The exposure assessment should be revised accordingly.

15. Page 34, 1st Paragraph, Line 3: It is stated that the intermediate-term exposures may be refined as more atrazine-specific use data becomes available. The following are the aerial scenarios where intermediate-term risks were less than 100:

    Mixing/loading liquid and DF formulations for aerial application:
    - sugarcane (2.6 and 4 lb a.i./A, 350 acre)
    – Christmas trees (350 acre)
    - sod farms (350 acre)
    – conifer forests (4 lb a.i./A, 350 acre)
    – chemical fallow (3 lb a.i./A, 350 and 1200 acre)
    – chemical fallow (1.4 lb a.i./A, 1200 acre)
    – CRP and grasslands (2 lb a.i./A, 1200 acre)
    – corn and sorghum (1 and 2 lb a.i./A, 1200 acre)

    Information regarding yearly aerial application of atrazine to sugarcane, corn, and sorghum indicate that the daily acreage assumptions used by EPA are not feasible when extrapolated to a period of 30 days. Thus, either the daily acreage assumption is incorrect or the assumption that spraying takes place for a period of more than 30 days per year is incorrect. Information obtained from Doane Marketing show that the latter is the case.

    Actual use of atrazine in aerial applications was determined for sugarcane, corn and sorghum utilizing Doane Marketing Research, Inc. The crop rate and acreage scenarios were expanded to show the total number of pounds active ingredient and acres for 30 days that the individual mixer/loader would have to complete to meet the scenario limits. The Doane database was queried for atrazine active ingredient applied by air, and the number of pounds and acres at the state level for the years 1999 and 2000 (Appendix 4 of Attachment 5, Table 1). From these values, the average pounds active ingredient per acre by state could be calculated. Unless the 30 day combination of total pounds, acres, and lbs ai/A were met within a state, there is no possibility of an individual handling enough product to reach the unacceptable intermediate-term risk scenario.

    Sugarcane: Only LA showed any aerial application data. The scenario number of pounds applied (350 acres/day x 30 days x 2.6 lb a.i. /A = 27,300 lb a.i.) was not reached, and the calculated number of treated acres (350 acres/day x 30 day =10,500 acres) was not met in 1999. While the number of acres was met in 2000, the average application rate of 1.67 lb a.i./A was below that specified, 2.6

and 4.0 lbs. a.i./A, in the exposure scenario. Thus the sugarcane criteria were not met even if one mixer/loader serviced the entire state. Please revise the risk assessment accordingly.

Corn: the exposure scenario specifies 1.0 and 2.0 lb a.i./A on 1,200 acres per day, or 36,000 to 72,000 lb ai, and 36,000 acres. In the entire U.S. for the years 1999 and 2000, the number of pounds of aerial atrazine per year reported by Doane ranged from 435,000 and 187,000 and the acres between 435,000 and 220,000. Aerial application was reported in only 16 states, with considerable annual variation. The states of KS, NE, OK, and TX were the only ones exceeding 50,000 acres per given year. Also, most annual average rates per acre were less than 1.0 lb a.i./A per given state. Since it is highly unlikely that one mixer/loader services the whole state, any given individual would not have handled the quantity of atrazine specified in EPA's intermediate-term exposure scenario. Please revise the risk assessment accordingly.

Sorghum: the exposure scenario specifies 1.0 and 2.0 lb a.i./A on 1,200 acres per day, or 36,000 – 72,000 lbs and 36,000 acres. In the entire U.S. for 1999 and 2000, the number of pounds of atrazine applied aerially ranges between 390,000 and 450,000 lbs and the acres range between 340,000 and 300,000. Aerial applications occurred in 1999 and 2000 in seven sorghum growing states, with considerable annual variation in acres treated. Of these, there were only two states (TX and NM) in which the amount of atrazine applied by air exceeded what the EPA model predicted for one mixer/loader. Since it is highly unlikely that one mixer/loader is servicing the entire state, the chance of any given individual meeting the intermediate-term scenario is remote. Please revise the risk assessment accordingly.

Doane does not have survey data from other uses in the list including CRP/grassland, Christmas trees, sod farms, conifer forests, and chemical fallow, but the relative use of atrazine on these sites is minor when compared to the crops discussed above.

There is another aspect of the scenario that needs to be examined. This involves the number of 2.5 gallon jugs handled within an 8 hour day to meet the scenario specification. Table 2 in Appendix 4 of Attachment 5 shows in detail the various crop risk scenarios, the daily maximum number of pounds, number of 2.5 gallon jugs to provide those pounds, required jug rinses (as directed on the AAtrex 4L label), the calculated number of minutes per jug, and an estimation of whether this is physically possible for 8 continuous hours. The estimate is just for the jug handling, and does not allot time for retrieving material and filling the aircraft with water. For Christmas trees and sod farms, which did not list an application rate, the labeled maximum of 4 lb a.i./A has been used for the calculations. The 2.5 gallon container holds 10 lb atrazine (2.5 gal jug x 4 lb a.i./gallon = 10 lb a.i. per jug). Across the crops/sites of concern, the pounds of atrazine needed per day ranges from 1,400 to 3,600. The poundage range would thus require 140 to 360 2.5 gallon jugs per 8 hour day. On an hourly basis, the mixer/loader would have to empty ~17 to 45 jugs per hour. The AAtrex label specifies under Container Disposal: “Triple rinse (or equivalent) and offer for recycling or reconditioning,……”. In addition to the initial emptying of each jug containing AAtrex 4L, the mixer must rinse (3X) each jug to meet label requirements. Thus, in addition to the 17 to 45 jugs of AAtrex 4L to empty per hour, the individual would also have to rinse the jugs. The physical impossibility of this open loading system needs to be considered.

16. Page 38, 2nd item: The mixing/loading and incorporating liquid atrazine into dry bulk fertilizer does not take place on farms. This reference should be removed. Syngenta has submitted a document (Appendix 3 of Attachment 5) that details the herbicide/fertilizer application process so that the risks can be more accurately assessed.

17. Page 38, 3rd item: Exposure data for granular ground application from data in PHED can be used to assess exposure to workers applying granular atrazine impregnated fertilizer to soil. The data in PHED are generic and can be used as surrogate for many different active ingredients as long as the formulation is constant.

18. Page 38, 7th item: In the review of handler studies incorporating biomonitoring [Study submitted to the Agency in several phases including interim reports, final reports, and amendments are given MRID 439344-17, 439344-18, 441521-09, 441521-11, 443154-03, and 44154-04.] EPA cites two issues related to this study (see below). Based on the information and references in Syngenta's comments (also below) these issues should be resolved and the statement regarding low confidence removed from the risk assessment.

EPA Statement
"Another significant issue was the choice of urinary total chloro-triazine residues for biological monitoring. The chloro-triazine residues represent only 12% of the total atrazine dose. It is HED policy that the predominant metabolite be used as the indicator for calculating the parent chemical, thereby reducing the error potential when back-calculating the dose."

Syngenta Comment
There is general agreement that atrazine and its chloro-triazine metabolites are the moieties of toxicological concern (MARC[1]). Furthermore, Syngenta has established a relationship between administered dose and eliminated dose in the human oral dose study on atrazine[2]. In this study, it was determined that approximately 12% of the chloro-metabolites were eliminated in the urine. Thus, by directly measuring the moieties of toxicological significance, the back-calculated input dose of atrazine is not a critical feature of this assessment. This method was utilized mainly to permit a comparison of the biomonitoring results with whole body dosimetry and the Pesticide Handlers Exposure Database. The

general concordance of these three independent methods for estimating the atrazine exposure provides the reviewer a level of assurance that the estimates from all these methods are likely to be correct.

EPA Statement

"Also, urine creatinine and creatinine clearance were not measured. Without these measures, there is no way to verify the accuracy of the volume of urine collected during biomonitoring (which is critical to calculating the total dose absorbed)."

Syngenta Comment

Urinary creatinine/clearance are parameters to measure if only a partial sample of the daily urine output is collected, i.e., first void. In this agricultural handler study[3], total daily urine outputs were collected, making creatinine correction for volume unnecessary. The usefulness of creatinine data has been a subject of much debate and is, in fact, described in the EPA Series 875.1500 as only a procedure the investigator should consider as a way of monitoring completeness of collection. This does not indicate in any way that this data is necessary for data evaluation or that it is critical to the study design.

19. Page 39, Post application Exposure Scenarios: Although the EPA has acknowledged that atrazine is applied during the “dormant” months to conifer tree farms when staking and shaping are not done, the risk assessment calculation has not been removed from EPA Table 12. Please revise the risk assessment accordingly.

20. Page 30, Post application Exposure Scenarios: Although the EPA has acknowledged that harvesting sod would not occur within the 30-day pre-harvest interval in Florida and other states, it is still part of the risk assessment presented in EPA Table 13 and should be removed.

21. Page 43, 1st bullet item: It is scientifically inaccurate to compare the toxicity endpoint from a long-term toxicity study to exposure based on foliar residues found at 7 days after an application. The time periods are not similar. Since the intermediate-term re-entry risk assessment is designed to evaluate risks to workers handling atrazine-treated crops for periods longer than 30 days, the residues at 30 days, or more, after an application should be used. Please revise the risk assessment accordingly.

22. Page 44, 3rd paragraph: On page 39 it was acknowledged that turf (sod) harvesting would not occur within 30 days of an atrazine application; however, a harvesting risk assessment was performed (Table 13) and summarized. This exposure scenario should be removed.

23. Page 44, 4th paragraph, Line 3: On page 39 it was acknowledged that harvesting of Christmas trees does not take place during the same time period as an atrazine application; however, the harvesting risk assessment was performed (Table 12) and summarized. This exposure scenario should be removed.

The staking of Christmas trees is not done. Several prominent university personnel were contacted to obtain localized information as to cultural practices and determine if staking of Christmas trees is a normal cultural practice. Their comments follow:

Dr. John Ahrens
Phone: 860-683-4977
Weed Scientist Emeritus
Consulting Weed Scientist
CT Agricultural Experiment Station
Windsor, CT.

Dr. Ahrens is also a Director of the National Christmas Tree Association and a member of the Connecticut Christmas Tree Association, New York Christmas Trees Association, and the Vermont and New Hampshire Christmas Tree Association. In these capacities, he represents the Christmas Tree cultural practices of the Northeastern United States. Dr. Ahrens is also past president of the Weed Science Society of America, and past president of the Northeast Weed Science Society. Dr. Ahrens has been working in this area for more than 30 years.

According to Dr. Ahrens, atrazine application normally occurs in the spring of the year. Tree rows are normally on 6 to 7 foot row centers with the herbicide applied as a 50% band directed under the trees. The row middles are not treated and are usually mowed. Complete vegetation control between rows is not desirable because of potential muddy conditions during other cultural operations. Thus, broadcast herbicide application is not used, and cost would double if it were used. Aerial application of herbicides is not used in the Northeastern U.S. Fertilizer application can occur before, but usually after herbicide application. Fertilizer application equipment directs fertilizer over the row as a band treatment. Staking of Christmas trees is NOT done.

Dr. Ahrens is not aware of this being a practice anywhere. Staking in landscape plantings of deciduous species or “balled” conifers may occur, but this is completely different than Christmas tree plantations, where the tree has grown under natural conditions. Dr. Ahrens indicated that he has never seen a published paper referring to “staking” in the cultural practices of Christmas Tree production.

Dr. Melvin Koelling
Phone: 517-355-0096
Professor of Forestry
Department of Forestry
Michigan State University
East Lansing, MI

Dr. Koelling has been at MI State conducting research in Christmas Trees since 1975. In addition, he is a private grower of a 100 acre Christmas tree plantation. He is a member of the National Christmas Tree Association, and the Michigan Christmas Tree Association. The following information is also relevant for the states of WI, MN, OH, IN, IL, IA, MO, NE, and KS.

According to Dr. Koelling, aerial application of triazines does not occur. Ground application can be either banded or broadcast. Special application equipment has been designed for broadcast application, such that there is minimal spray contact only to the bottom foot of the trees. Triazine application would occur in April. There would be at least a 30 day interval between herbicide application and fertilizer application, banded or broadcast, in the spring. Tree pruning is normally in August to October for most species, except pine, which would be in late June to early July. Tree staking is not a cultural practice in commercial Christmas Tree production. Normal trees do not need staking. The only possible exception would be to correct winter damage or frost heaving, and this would be in March before herbicide application, or in the fall for “weak” species like scotch pine – whose market share is rapidly decreasing. It should also be noted, that atrazine is not used on scotch pine because Velpar is preferred as it can be sprayed over the top to young trees. Further, large scale staking would be too expensive to be considered. Staking is not a cultural practice, and an exposure assessment for staking after a triazine treatment in Christmas Tree plantations is not justified.

Dr. Mike Newton
Phone 541-737-6076
Forest Science Department
Oregon State University
College of Forestry
Corvallis, Oregon

Dr. Newton is a Fellow in the Society of American Foresters, Fellow in the Weed Science Society of America, Fellow in the Western Society of Weed Science, Member of the Ecological Society of America and a Member of the Oregon Small Woodland Association. He has conducted research at Oregon State for over 30 years. His information is representative for the states of Oregon, Washington, Idaho, and California.

Christmas tree production was discussed with Dr. Newton, and atrazine is not a major product. Herbicides are rotated throughout the 6 to 7 year growing cycle, and atrazine would be used 1 or 2 times per crop. Other herbicides would be Velpar, Roundup, 2,4-D, or Stinger. Herbicides are applied in March or April. Most applications of atrazine, Velpar, and 2,4-D would be aerial by helicopter, or by high boom ground equipment. Fertilizer, when used, is applied by aerial application and is normally done in February or March. Trimming or shearing of the tree's new growth is done after mid-July, when annual growth is complete. Dr. Newton has never heard of staking Christmas trees. Clearly, staking is not a cultural practice, and an exposure assessment for workers staking within days after an atrazine application is not justified.

Dr. Larry Kuhns
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Professor of Ornamental Horticulture
Department of Horticulture
PA State University
University Park, PA

Dr. Kuhns is also a private Christmas Grower (>40 acre plantation) in addition to his university activities which has involved research in Horticulture for over 20 years. He is on the Board of Directors for the PA Christmas Tree Growers Association and is a member of the PA Landscape and Nurseryman Association.

Triazine herbicides are normally applied in the spring, (April) with some use in fall (Sept). Application is a directed spray on a 50% band on the tree row. Contact to the tree is minimal, the lower 12 inches at the most. Fertilizer is applied in April and September, also on a directed 50% band in the row. Trimming or shaping is done in June through August. Aerial application of triazines to Christmas trees does not occur. Staking of trees is not a cultural practice in Christmas Tree production. Potential exposure to atrazine after its application is not possible since tree staking is not a cultural practice.

Summary of Expert Information on Christmas Tree Staking:

Authoritative experts from CT, PA, MI, and OR, representing these and surrounding states, have confirmed that staking of Christmas trees is not a cultural practice, and to their knowledge is never done. Other factors in Christmas tree culture further remove the possibility of an atrazine application followed within days by a “staking operation.” All of these experts agreed that such a scenario does not occur. Syngenta thus requests that this scenario be removed from the risk assessment.

24. Page 47, 5th bullet item, Line 4: Syngenta supports the use of label language on consumer products to prohibit hand spreading of granulated product.

25. Page 49 last bullet item: Syngenta supports the use of label language on consumer products to prohibit hand spreading using hand-held spreaders of granulated product and will work with EPA to ensure that this label restriction will be added to all consumer labels for products containing atrazine.

26. Page 50, 4th bullet item: According to discussions on March 21, 2001, between the ORETF and representatives from EPA, it appears that the review of the ORETF mixer/loader/applicator monitoring data is complete and these data are viewed as high confidence. Therefore the statement “The data from the ORETF studies has been classified as medium-to-high confidence level” is incorrect and should be revised.

27. Page 50, Postapplication Exposure Scenarios: The statement that duration of postapplication dermal exposure is expected to be either short-term or intermediate-term is incorrect. It contradicts what is stated three sentences later in the same paragraph: “it is not expected that individual residential exposure duration would exceed 30 days in duration.” Please correct.

28. Page 51, Summary of Postapplication Spray Drift/Track-In Risks: This is a new risk assessment category that is not in the publicly available 1997 version of the EPA Residential SOPs. Although Syngenta recognizes that there exists some preliminary research data in this area, we remind the Agency that it should provide an opportunity for the scientific community to fully evaluate the findings from these studies and to discuss how to form a generic regulatory risk model.

29. Page 52, 2nd Paragraph, Line 4: Delete the words “…and intermediate-term (DAT 7)…” as this scenario is no longer applicable.

Page 52, 3rd Paragraph: Syngenta has provided information on granule size distribution for consumer products containing atrazine. The statements that "the 'weed and feed' (fertilizer/herbicide combination) granules would be considered more attractive and more likely to be consumed if readily visible and easily picked up by a child" and "the granular product was described by Scotts as having the size of 'beach sand'" are misleading. Syngenta atrazine is only sold in combination with fertilizer ("weed and feed") for consumer use on lawns. As noted in the document prepared by Syngenta (Appendix 2 of Attachment 5), the granule size and percent of granules by size varies by manufacturer.

The statement that less than a teaspoon of atrazine-containing fertilizer would exceed the toxic level of concern is scientifically unsubstantiated and very misleading. The amount of atrazine-containing fertilizer granules in a teaspoon is highly dependent on the size of the granules; thus it is possible that a teaspoon of large granules would not exceed the toxic level of concern. The other point that must be considered for this type of a risk scenario is the availability of the granules. The granules are so small and the percent of atrazine in the product so low, that a child would have to pick out approximately 200 granules from a lawn to consume enough atrazine to provide the dose calculated by EPA. Please revise the risk assessment accordingly.

30. Page 55, 1st Paragraph: The "hand-licking" risk model has not been adequately peer reviewed and should not be included in any assessment until properly evaluated and data availability and needs are understood. There are no data to presume that results from a corn dislodgeable foliar residue study in any way represent transfer of pesticide residues from turf to a child's moist hand, so the corn DFR value should not be used to justify the 5% transfer factor. The default 5% transfer rate should in fact be replaced by the actual turf transferable residue data for atrazine adjusted for wet hands. As seen in the Clothier (2000) study, a 3-fold increase in wet-versus dry-hand transfer should be used until more relevant data are developed for this scenario in turf. When the TTR data for granular atrazine are multiplied by a factor of 3 and then placed into the model, the "hand-licking" risks are acceptable.

Based on the large TTR data sets submitted to EPA by the ORETF as well as proprietary turf studies submitted by Syngenta, it is apparent that the transferability of liquid pesticides is significantly greater than that of granular pesticides. That difference in transfer is not taken into account in the EPA "hand-licking" model. Please revise to take this difference into account in the assessment. This revision does not reflect Syngneta's agreement that the "hand-licking" model is valid or realistic.

It is clear that the "hand-licking" model being used by EPA for regulatory decisions needs further validation. Until that has been done, it is inappropriate to use this model for regulatory decisions.

31. Page 55, 3rd Paragraph: The use of data from a corn foliar dislodgeable residue study to reflect how much residue a child may remove when mouthing treated turf or bringing an object to the mouth is speculative. The model should be validated prior to being used in regulatory risk assessments.

32. Page 57, 1st bullet item: Remove the words “and intermediate-“ as the risk assessments are for short-term risks only.

33. Page 57, 3rd bullet item: As noted previously, there has been no relationship developed to correlate the data from a corn dislodgeable foliar residue trial to how much pesticide residue can be transferred from treated turf to a child’s hand.

34. Page 57, 5th bullet item: The statement that “atrazine TTR study data indicate transferable residues are greater after the day of application” contradicts the TTR data presented in EPA Table 11. The highest residues in three of the four sites were seen at 12 hours after the application; at the fourth site, the highest residues were seen at the sampling immediately following the application.

35. Page 57, 6th bullet item: This bullet should be removed since all residential risk assessments were for short-term exposure only.

36. Page 57, 2nd Paragraph, Line 8: As noted previously, the arbitrary aggregation of three activities with atrazine-treated turf – golfing on atrazine-treated golf courses, mowing atrazine-treated grass, and “high-contact activities” on atrazine-treated grass – is not realistic nor an approved regulatory scenario.

37. Page 57, last paragraph/page 58, first paragraph: The same-day aggregation of applying atrazine to a half-acre lawn and then playing on the treated lawn for 2 hours is not realistic nor an approved regulatory scenario. Both individual exposure scenarios are based on conservative, high-end parameters, and it is, therefore, inappropriate to add these screening-level point-estimates together. Syngenta is unaware of any published EPA policy or exposure assessment guideline which states this aggregation as “a high-end, screening level exposure estimate” and request a copy of this policy.

38. Pages 58, 2nd paragraph: There are no data to presume that residues from a corn dislodgeable foliar residue study represent transfer of pesticide residues from turf to a child’s moist hand. However, in the interest of presenting a calculation of this type of scenario, the default 5% transfer rate should be replaced by the actual turf transferable residue (TTR) data from the atrazine turf study and adjusted for wet hands. As seen in the Clothier (2000) study, a

3-fold increase in wet- versus dry-hand transfer should be used until more relevant data are developed for this scenario in turf. When the TTR data for granular atrazine are multiplied by a factor of 3 and then placed into the model, the “hand-licking” risks are acceptable.

Based on the large TTR data sets submitted to EPA by the ORETF as well as proprietary turf studies submitted by Syngenta, it is apparent that the transferability of pesticides from turf is dependent on whether the formulation is granular or liquid. This difference in transfer based on formulation is not taken into account in the EPA “hand-licking” model.

39. Page 58, Aggregate Exposure Estimates, 1st paragraph: The arbitrary aggregation of all potential activities that a person may do in an 8 hour period on a pesticide treated lawn (4 hrs of golf + mowing 2 hrs + 2 hrs of high-contact activity) immediately following an application is unfounded and unreasonable. There are no activity pattern data to form a basis for such a risk assessment nor is this type of risk manipulation sanctioned in the EPA Residential SOPs.

40. Each one of these individual risk assessments are based on upper-bound assumptions and contain a bias towards conservatism; the addition of these individual risks results in exaggerated exposure estimates that are of little value in terms of assessing true risk. This specific aggregate methodology is not scientifically valid and should be removed.

41. Page 59, Summary of Postapplication Risk Concern, 2nd paragraph: As mentioned previously, Syngenta ascertains that the hand-licking model has not been validated. Syngenta has prepared a document that describes the size characteristics of atrazine-impregnated granular fertilizer used on residential turf as well as grass morphology; this information provides additional evidence that ingestion of granules is not a likely actual event and should be removed from this assessment.

42. Page 59, Data Gaps and Uncertainties, 2nd bullet item: The statement that the TTR studies were conducted without watering-in is incorrect; the granular turf study (MRID 449588-01) had both non-irrigated and irrigated plots. The impact of irrigation on residues and potential exposure should be presented.

43. Page 59, Data Gaps and Uncertainties, 4th bullet item: Data on granular size and product breakdown has been generated by Syngenta and submitted to EPA. Turf residues following irrigation is available to EPA in the submitted granular TTR study (MRID 449588-01).

44. Page 59, Recommendations: Syngenta agrees with EPA that probabilistic approaches help refine risk estimates. Because a policy on the development and use of probabilistic non-dietary risk assessment has not been issued, additional discussions on data sets and methodologies are needed.

45. Table 6: As mentioned previously, some of the scenarios assessed for intermediate-term risks should not be calculated as it is not possible to treat at the daily acreage assumed when extrapolated to a period of 30 days or more.

46. Table 6: Mixing/Loading Liquid Formulations for Lawn Handgun Application (LCO) – the assumption that 100 acres of lawn and/or golf course will be treated with a hand-gun appears to be erroneous. Using the EPA assumption that a typical LCO treats 5 acres of turf per day, this mixer/loader is loading 20 vehicles with atrazine in one day for the short-term risk assessment, and loading 20 vehicles per day for 30 days for the intermediate-term risk assessment. This is an overestimate of daily acres treated for short-term risks and the assumption that this could occur for 30 days out of a year is highly improbable.

47. Tables 13 and 14: Footnote b – remove the example of Bermuda grass rights-of-way as this is not an appropriate example for a sod farm or golf course risk assessment.

48. Table 17: footnotes d and e should be removed as there was no intermediate-term risk assessment done. The aggregate daily dermal risks for adults should be removed as this is not a standard approved risk assessment.

49. Table 18: Footnote d – remove references to intermediate-term exposure and risk. Footnote e – remove reference to intermediate-term assessments.

References

1. Atrazine (080803) Reregistration Case No. 0062. HED Metabolism Assessment Review Committee: Residues to be Regulated and Residues of Concern for Dietary Assessment. No MRID. DP Barcode. November 15, 2000.

2. Davidson, I. 1988. Metabolism and kinetics of atrazine in man. MRID 43598603.

3. Selman, F.B. and L. Rosenheck. 1996. Evaluation of the potential exposure of workers to atrazine during commercial mixing, loading, and spray application to corn. Final Report. Project No. 101930; Study No. 178-95. MRID 441521-09.

4. Clothier, J. 2000.

Appendix 1 of Attachment 5

Comments on the Use of a 5% Factor Applied to the Application Rate for Assessment of Hand-to-Mouth Exposure to Turf Treated with Atrazine

EPA has used a 5% factor in the atrazine human health risk assessment to reflect concern about increased exposure to pesticide residues during hand-to-mouth contact due to wet hands or sticky fingers. EPA has applied this factor only for exposure from hand-to-mouth contact. Additionally, EPA has applied this factor to the maximum application rate of atrazine to turf, rather than using the atrazine-specific turf transferable residue (TTR) data that was used in the dermal exposure assessment. The following presents information showing that in the atrazine preliminary risk assessment use of chemical specific data is more appropriate for the most accurate estimation of risk.

EPA has presented the Standard Operating Procedures (SOP) (EPA 1997a) used for assessment of non-dietary (residential) scenarios to the Science Advisory Panel (SAP) for peer review prior to their use for regulatory purposes. The SOPs were initially presented to the SAP in September 1997 and a revised version was made available in December 1997 (EPA 1997b) which incorporated comments from the SAP. In September 1999, additional revisions and issues regarding the SOP factors were presented to the SAP (EPA 1999a). The factor being discussed herein was discussed briefly in the revisions presented in September 1999 (EPA 1999a) and in the SAP final report (EPA 1999b). Based on a review of the SAP background document, references listed in the background document, and the SAP final report from the September 1999 meeting, it can only be said that the conclusions were equivocal.

The background document for the SAP report proposes the use of the 5% as: "<u>In the absence of chemical specific transferable residue data</u> on turfgrass, the Agency recommends dislodgeable values of 5 percent for use in post-application <u>dermal</u> exposure estimates in the Residential SOPs." (page 25, EPA 1999a, emphasis added). It should be noted there are two important issues: 1) the absence of chemical specific data; and 2) use for dermal exposure. There is chemical-specific data for atrazine; it shows the turf transferable residue to be around 0.4% for the granular fertilizer formulation.

EPA references a variety of sources in the SAP background document and during discussions with atrazine registrants to support the proposal of a 5% factor applied to the initial application rate (Clothier 2000; Camann et al. 1995; and Lu and Fenske 1999). The report by J. Clothier (2000) presents a 2.5-3.5 times higher transfer efficiency for wet palms versus dry palms. Camann et al. (1995) and Lu and Fenske (1999) observed that using moistened materials for dislodging residues resulted in less that 5% transferability (0.6 to 2.1% and 1 to 3.1%, respectively). Additionally, these references present data that show that the hand press method of transferring residues gives much lower transferability than methods used in TTR studies. Thus, the data from the atrazine turf study is already conservative as it was gathered using a modified cloth roller method. Finally, these references also support that dislodgeability is greatest from vinyl (the source of the Clothier data) compared to carpet or turf, so applying data from vinyl to a turf analysis is even more conservative.

The final SAP report states, “With respect to moist or sticky hands, there are not enough available data to make a determination whether using a higher “percent transferable residue” factor is justifiable.” (page 11, EPA 1999b).

Finally, the use of the 5% factor has not been used consistently by the Agency. EPA staff have stated that this factor was used in other assessments of exposure to organophosphate products on turf. A review was conducted of the risk assessments currently available to the public on the Internet at the EPA-OPP website. The following conclusions can be made:

- The factor was used in the REVISED malathion assessment for defense of the mosquito-spray scenarios where no TTR data was available. This is an appropriate use of the factor.

- The factor was NOT used in the acephate assessment, instead TTR data was used. This is an appropriate use of TTR data and the factor is unnecessary.

- The factor was NOT used in the bensulide assessment, instead TTR data was used. This is an appropriate use of TTR data and the factor is unnecessary.

In summary, the use of the 5% factor has not been adequately peer-reviewed and a review of the data on the effect of wet palms does not support the use of this factor. It is appropriate to use chemical-specific data, without application of additional factors, when they are available (i.e., TTR data). Nonetheless, Syngenta recognizes the need for data development in this area.

<u>Appendix 2 of Attachment 5</u>

Atrazine Use in Southern Turf: Additional Information for Residential Turf Risk Assessments

THIS DOCUMENT WAS REMOVED BECAUSE IT CONTAINS SYNGENTA DATA

<u>Appendix 3 of Attachment 5</u>

Atrazine Impregnation on Bulk Dry Fertilizer and Mixing Atrazine with Bulk Liquid Fertilizer: A Description of the Process and Occupational Risk Assessment

THIS DOCUMENT WAS REMOVED BECAUSE IT CONTAINS SYNGENTA DATA

Appendix 4 of Attachment 5

Doane Marketing Research Data on Aerial Applications

Table 1

atzaerial Sheet1

Atrazine: Occupational and Residential Safety - RED Response

Unacceptable Intermediate-term Risks With PPE Per EPA Assumptions

Mixing/Loading Liquid and WG for Aerial Application to Various Crops

Scenarios Compared to Doane Marketing Research Use Data For 1999 and 2000.

									States Where	No. M/L / State To Reach The Single M/L Limit			
	Scenario Limits:		1999	1999	1999	2000	2000	2000	An Individual	1999	1999	2000	2000
	Combined Lbs. / Acres over		Total Lbs.	Total Ac	Avg. Lbs.	Total Lbs	Total Ac	Avg. Lbs.	Limit is	Total Lbs.	Total Ac	Total Lbs	Total Ac
Scenario Based on 4L in 2.5 Gal. Jugs	30 Days per ML	Area	Aerial	Aerial	AI / Ac	Aerial	Aerial	AI / Ac	Exceeded	Aerial	Aerial	Aerial	Aerial
Sugarcane (2.6 and 4 lb ai/A, 350 Acres)	27300-42000 / 10500	Total US	7700	3850	2.00	17722	10610	1.67					
		LA	7700	3850	2.00	17722	10610	1.67	No				
Corn (1&2 lbs/A, 1200 Acres)	36000-72000 / 36000	Total US	434900	432164	1.01	186400	216508	0.86					
		Alabama	9074	4537	2.00	9329	4665	2.00	No				
		Colorado	2087	1391	1.50	6899	17396	0.40	No				
		Kansas	75136	81303	0.92	0	0		Yes	2.1	2.3		
		Louisiana	6759	3394	1.99	9618	6595	1.46	No				
		Minnesota	62738	43136	**1.45**	0	0		**Yes**	1.7	1.2		
		Nebraska	85534	89766	0.95	25690	48824	0.53	Yes	2.4	2.5	0.7	1.4
		New Jersey	8261	10879	0.76	0	0		No				
		New Mexico	3884	5127	0.76	2298	1915	1.20	No				
		New York	0	0		7998	3999	2.00	No				
		North Dakota	259	259	1.00	0	0		No				
		Ohio	44864	34528	**1.30**	0	0		**Yes**	1.2	0.96		
		Oklahoma	46189	60221	0.77	19641	22584	0.87	Yes	1.3	1.7		
		Pennsylvania	21066	21925	0.96	0	0		No				
		South Dakota	0	0		3664	3664	1.00	No				
		Texas	35014	39958	0.88	101264	106867	0.95	Yes	0.97	1.1	2.8	3.0
		Wisconsin	34034	35740	0.95	0	0		No				
Sorghum (1&2 lbs/A, 1200 Acres)	36000-72000 / 36000	Total US	448261	307041	1.46	392890	337304	1.16					
		Colorado	4781	6088	0.79	38556	34536	1.12	No			1.1	0.96
		Kansas	33914	28518	1.19	115420	105369	1.10	No			3.2	2.9
		Louisiana	215589	86330	2.50	17250	8625	2.00	Error??	6.0	2.4		
		Nebraska	0	0		255	340	0.75	No				
		New Mexico	45952	49443	0.93	80382	57592	**1.40**	**Yes**	1.3	1.4	2.2	1.6
		Oklahoma	17347	22730	0.76	2790	3100	0.90	No				
		Texas	130678	113932	**1.15**	138237	127741	**1.08**	**Yes**	3.6	3.2	3.8	3.5
Corn (2 Lbs/A, 1200 Acres)	72000 / 36000	Total US	434900	432164	1.01	186400	216508	0.86					
Sorghum (2 Lbs/A, 1200 Acres)	72000 / 36000	Total US	448261	307041	1.46	392890	337304	1.16					
CRP/Grassland (2 lbs/A 1200 Acres)	72000 / 36000	Total US											
Chemical Fallow (3 lbs/A, 1200 Acres)	108000 / 36000												
Christmas Trees (350 Acres)	?? / 10500												
Sod Farms (350 Acres)	?? / 10500												
Conifer Forests (4 lbs./A, 350 Ac)	42000 / 10500												
Chemical Fallow (3 Lbs./A, 350,1200 Acres)	31500-108000 / 10500-36000												
Chemical Fallow (1.4 lb/A, 1200 Acres)	50400 / 36000												
CRP and Grasslands (2 lbs./A, 1200 Ac)	72000 / 36000												

Appendix 4 of Attachment 5

Table 2

Atrazine: Occupational and Residential Safety - RED Response
Unacceptable Intermediate-term Risks With PPE Per EPA Assumptions
Mixing/Loading Liquid (2.5 Gal. Jugs) and WG for Aerial Application to Various Crops

Scenarios Compared to Doane Marketing Research Data For 1999 / 2000 showing improbability that scenario limits are reached.

Scenario Based on 4L in 2.5 Gal. Jugs, And a SINGLE Mixer / Loader	Scenario Limits: Combined Lbs. / Acres over 30 Days per Mixer/Loader	Maximum Lbs. Mixed Per Day Per Scenario	Number of 2.5 Gal Jugs to Empty/ Day	Number of 2.5 Gal Jugs to Empty/ Hr.	No. of Jug Rinses (3/jug/label) Per Hr.	Number of Jug Rinses Per Day	No. of Jug Emptyings Per Day	Avg. No. Minutes / Jug Emptying	Physically Possible for 8 Continuous Hours*/Day
Sugarcane (2.6 and 4 lb ai/A, 350 Acres)	27300-42000 / 10500	1400	140	17.5	52.5	420	560	0.9	NO
Corn (1&2 lbs/A, 1200 Acres)	36000-72000 / 36000	2400	240	30.0	90.0	720	960	0.5	NO
Sorghum (1&2 lbs/A, 1200 Acres)	36000-72000 / 36000	2400	240	30.0	90.0	720	960	0.5	NO
Corn (2 Lbs/A, 1200 Acres)	72000 / 36000	2400	240	30.0	90.0	720	960	0.5	NO
Sorghum (2 Lbs/A, 1200 Acres)	72000 / 36000	2400	240	30.0	90.0	720	960	0.5	NO
CRP/Grassland (2 lbs/A 1200 Acres)	72000 / 36000	2400	240	30.0	90.0	720	960	0.5	NO
Chemical Fallow (3 lbs/A, 1200 Acres)	108000 / 36000	3600	360	45.0	135.0	1080	1440	0.3	NO
Christmas Trees (350 Acres) (4lbs./A?)	42000 / 10500	1400	140	17.5	52.5	420	560	0.9	NO
Sod Farms (350 Acres) (4lbs./A?)	42000 / 10500	1400	140	17.5	52.5	420	560	0.9	NO
Conifer Forests (4 lbs./A, 350 Ac)	42000 / 10500	1400	140	17.5	52.5	420	560	0.9	NO
Chemical Fallow (3 Lbs./A, 350,1200 Acres)	31500-108000 / 10500-36000	3600	360	45.0	135.0	1080	1440	0.3	NO
Chemical Fallow (1.4 lb/A, 1200 Acres)	50400 / 36000	1680	168	21.0	63.0	504	672	0.7	NO
CRP and Grasslands (2 lbs./A, 1200 Ac)	72000 / 36000	2400	240	30.0	90.0	720	960	0.5	NO

*This does not include any other associated activities or allowing for equipment movement.

Attachment 6

Syngenta's Comments on EPA's January 19, 2001, "Atrazine. HED's Revised Human Health Risk Assessment for the Reregistration Eligibility Decision (RED)" and the January 23, 2001 "Drinking Water Exposure Assessment for Atrazine and Various Chloro-Triazine and Hydroxy-triazine Degradates" Groundwater

Groundwater

Introduction

There are two primary population groups obtaining their drinking water from groundwater sources:

1. Population in Community Water Systems (CWS) using groundwater
2. Population using rural wells

There have been many monitoring programs throughout the United States where groundwater has been monitored in CWSs, rural wells and monitoring wells for atrazine. While some of the studies also include data on one or two of the chloro-triazine metabolites, desethylatrazine (DEA) and deisopropylatrazine (DIA), there are only two large-scale Syngenta studies that cover parent atrazine, simazine and all three of the chloro-triazine metabolites, DEA, DIA and diaminochloro-triazine (DACT). One is the Syngenta Rural Well Study submitted in 1996 (EPA MRID No. 43934414) and the Syngenta Groundwater CWS study being submitted with this submission (Attachment 10).

The purpose of this section is to discuss these data in relation to other monitoring studies and to propose ways to address exposure in these two population groups.

Syngenta Groundwater CWS Study

Syngenta recently completed and is submitting with this response the final report for a synoptic groundwater CWS study that was statistically designed from 1993-1998 PLEX data. A full discussion of the data is included with the final report (Attachment 10).

The following is a brief discussion of the data:

The study defined two primary strata, one consisted of CWS with at least one previous detection of atrazine ("detects stratum"), the other consisted of CWS with no detections of atrazine ("non-detects stratum"). Within each of these primary strata, 8 ("detects") and 9 ("nondetects") substrata were determined based on population served and atrazine use. Atrazine use was determined by measured atrazine residues in drinking water for the detect stratum and by the average atrazine use rate per county acre for the non-detect stratum. CWS were randomly selected for sampling from all 17 substrata in a way to allow median and 95th Percentile exposure estimates to be obtained for the entire population of CWSs in the 21 major use states. Samples were taken between May and September 2000 and analyzed for atrazine, simazine, and the three chloro-triazine metabolites.

For the non-detects stratum, representing more than 14,000 CWSs in the 21 use states, all the samples were far below the MCL of 3 ppb for atrazine and 4 ppb for simazine. Moreover, in no case did total chloro-triazine residues (including simazine) exceed 0.8 ppb in this group.

For the detects stratum, representing 459 CWSs (418 after adjustment for qualification and substratum sample weighting) in the 21 major use states, none of the wells exceeded the MCL for atrazine or simazine. In no case did any well from the detect stratum exceed 2.5 ppb for total chloro-triazines. This excludes one well in NE, which was taken out of service because of point source issues at the well.

The following exposure was determined for the total population of CWSs on groundwater in the 21 major use states:

- CWS in the previous detect category expose consumers to $\leq$ 1.47 ppb of total chloro-triazines (including simazine) at the 95th percentile; or, to $\leq$ 1.57 ppb, if expressed as the 95th percentile of the population of persons served.
- For the non-detect category at the 95th percentile, all persons, regardless of the CWSs or population served, are exposed to $\leq$ 0.09 ppb of total chloro-triazine residues.

A comparison of the substrata within the primary detect and non-detect strata shows that

- the data sets are not normally distributed;
- there are no statistically significant differences between any of the substrata in the non-detects stratum (see Tables 1 and 2 and Figure 1).
- there are 2 substrata in the detects stratum which were found statistically different, G11 (top quartile of concentration, top quartile of population served) and G16 (remaining 75% of concentration, within the third quartile of population served). The same pattern – higher chloro-triazine residues in strata with higher atrazine detects (G11, G13, G15, G17) was qualitatively observed within the stratum and confirmed efficient study design (see Tables 3. 4, 5, and Figure 2).

Table 1: Comparison: Substrata within Non Detects Stratum

One Way Analysis of Variance Monday, February 26, 2001, 16:48:34

Data source: Data 1 in Notebook

Normality Test: Failed (P = <0.001)

Test execution ended by user request, ANOVA on Ranks begun

Table 2: Kruskal-Wallis One Way Analysis of Variance on Ranks

Monday, February 26, 2001, 16:48:34

Data source: Data 1 in Notebook

	Group	N	Missing	Median	25%	75%
G21	15	0	0.00904	0.00522	0.0156	
G22	46	0	0.00802	0.00435		0.0209
G23	18	0	0.00971	0.00400		0.0240
G24	41	0	0.0101	0.00377	0.0254	
G25	13	0	0.00857	0.00530	0.0314	
G26	37	0	0.00604	0.00364		0.0124
G27	16	0	0.00869	0.00423		0.0188
G28	47	0	0.00831	0.00324	0.0163	
G29	2	0	0.0188	0.00800	0.0295	

H = 4.425 with 8 degrees of freedom. (P = 0.817)

The differences in the median values among the treatment groups are not great enough to exclude the possibility that the difference is due to random sampling variability; there is not a statistically significant difference (P = 0.817)

Figure 1: Substrata Comparison for Non-Detects Stratum [GW-CWS without previous Atrazine detects]

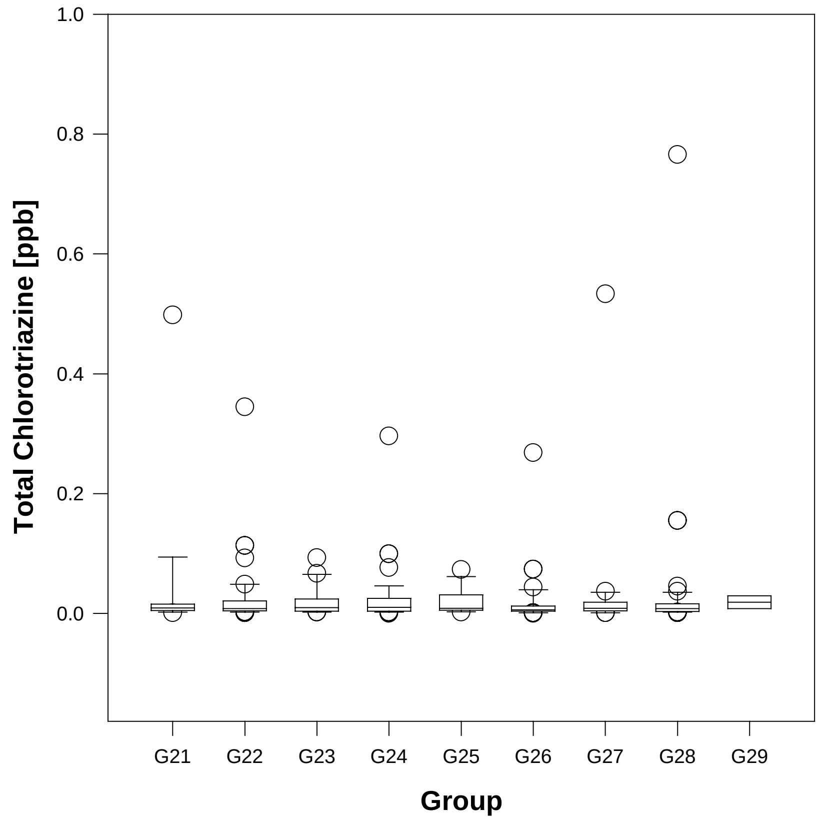


Table 3. Comparison: Substrata within Detects Stratum

One Way Analysis of Variance Monday, February 26, 2001, 16:43:23

Data source: Data 1 in Notebook

Normality Test: Failed ($P = <0.001$)

Test execution ended by user request, ANOVA on Ranks begun

Table 4. Kruskal-Wallis One Way Analysis of Variance on Rank

Monday, February 26, 2001, 16:43:23

Data source: Data 1 in Notebook

Group	N	Missing	Median	25%	75%
G11	13	0	0.403	0.191	0.736
G12	39	0	0.129	0.0201	0.318
G13	13	0	0.177	0.0206	0.670
G14	39	0	0.131	0.0196	0.381
G15	14	0	0.331	0.0680	1.054
G16	38	0	0.0700	0.0108	0.244
G17	12	0	0.466	0.209	0.766
G18	36	0	0.132	0.0249	0.421

$H = 19.009$ with 7 degrees of freedom. ($P = 0.008$)

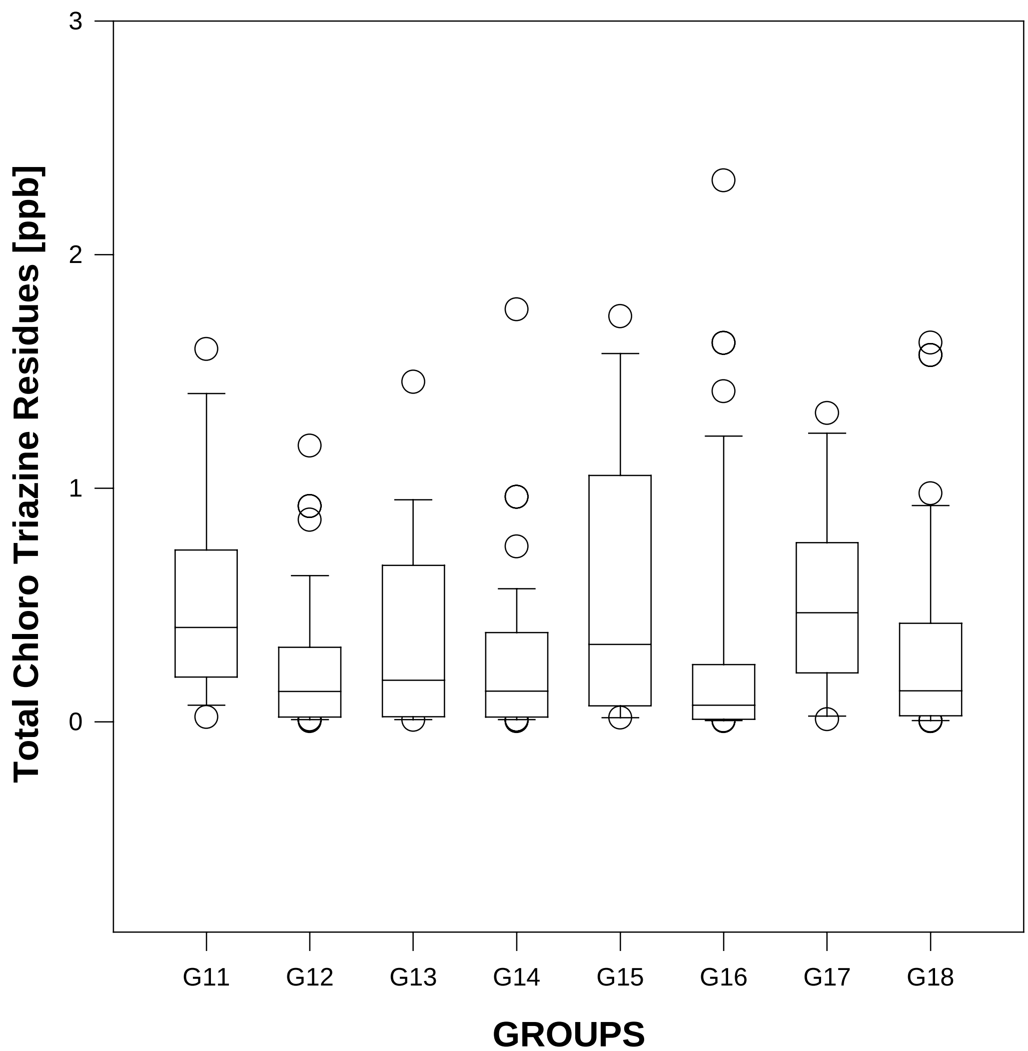
The differences in the median values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference ($P = 0.008$)

Table 5. All Pairwise Multiple Comparison Procedures (Dunn's Method)

Comparison	Diff of Ranks	Q	P<0.05
G11 vs G16	59.322	3.127	Yes
G11 vs G12	46.923	2.482	No
G11 vs G14	45.410	2.402	Do Not Test
G11 vs G18	42.741	2.238	Do Not Test
G11 vs G13	31.846	1.375	Do Not Test
G11 vs G15	10.841	0.477	Do Not Test
G11 vs G17	4.269	0.181	Do Not Test
G17 vs G16	55.053	2.816	No
G17 vs G12	42.654	2.189	Do Not Test
G17 vs G14	41.141	2.111	Do Not Test
G17 vs G18	38.472	1.955	Do Not Test
G17 vs G13	27.577	1.167	Do Not Test
G17 vs G15	6.571	0.283	Do Not Test
G15 vs G16	48.481	2.627	Do Not Test
G15 vs G12	36.082	1.962	Do Not Test
G15 vs G14	34.570	1.880	Do Not Test
G15 vs G18	31.901	1.716	Do Not Test
G15 vs G13	21.005	0.924	Do Not Test
G13 vs G16	27.476	1.449	Do Not Test
G13 vs G12	15.077	0.797	Do Not Test
G13 vs G14	13.564	0.717	Do Not Test
G13 vs G18	10.895	0.570	Do Not Test
G18 vs G16	16.580	1.208	Do Not Test
G18 vs G12	4.182	0.306	Do Not Test
G18 vs G14	2.669	0.196	Do Not Test
G14 vs G16	13.912	1.034	Do Not Test
G14 vs G12	1.513	0.113	Do Not Test
G12 vs G16	12.399	0.921	Do Not Test

Note: The multiple comparisons on ranks do not include an adjustment for ties.

Figure 2. Substrata Comparison for Detects Stratum [GW-CWS with previous Atrazine detects]



Syngenta Rural Well Study

The following are specific comments regarding potential, rural well exposure in HED's Revised Preliminary Human Health Risk Assessment:

1. Page 24: In the Rural Well Survey (RRW) conducted by Syngenta during the period from September 1992 to March 1995, six out of the 1505 total surveyed wells (0.40%) had total chloro-triazine concentrations (see Table 6) above 12.5 ppb (13–19 ppb). However, only one well had total chloro-triazine concentrations marginally exceeding 18 ppb (see p.70 of the revised preliminary risk assessment). Follow-up investigations revealed that approximately 250 gallons of a tank mix containing ~75 lbs. of atrazine were spilled in the vicinity of this well in the past. This further supports the conclusion that point source contamination contributed to the high detection of atrazine and chlorinated metabolites in that well.

   For the eight wells with total chloro-triazine residues inclusive of and between 12 and 19 ppb, one was not a drinking water well and one had a documented field spill in the well vicinity. Three of the wells had no recorded use of atrazine for at least five years prior to the sampling dates in the area where the wells were located indicating a potential point source contribution to the higher than expected chloro-triazines found (Table 6). One of the remaining three wells was detected at a level above the DWLOC for the most sensitive subgroup.

   Since the majority of the sampling activities for the concerned wells listed in Table 6 took place during 1992 to 1993, the beneficial effects from the last major use rate reduction, label improvements, and BMP programs for atrazine during the 1993 season and thereafter was not reflected in this study. For example, subsequent sampling by the state and analysis of the two wells in PA showed significant reduction in the concentration of atrazine plus its chlorinated metabolites, decreasing total concentration from 14 and 15 ppb to 7.6 and 6.8 ppb, respectively. The two WI wells, 17491-WI-084 and 17491-WI-092, showed reductions in parent atrazine concentrations from 2.3 ppb and 1.0 ppb in 1992 to 0.32 and 0.58 ppb in 1996, respectively. In these same wells, the total chloro-triazines were reduced from 13 and 12 ppb to 3.13 and 3.71 ppb, respectively during the same time period. To further confirm that point sources were the major contributor to total chloro-triazine residues in these wells, and to further establish the decreasing trend of total chloro-triazines Syngenta decided to resample the 14 wells with parent concentrations above the MCL of 3 ppb or total chloro-triazine residues above 12.5 ppb in March 2001.

   None of the fourteen re-sampled wells exceeded the atrazine MCL (3 ppb) or the EPA proposed total chloro-triazine DWLOC (12.5 ppb) for the most sensitive sub-population group. The results from this re-sampling effort are reported in Table 6 below:

Table 6. Syngenta Rural Well Survey Including 2001 Resampling Results

Well ID	Original RRW Sampling Date **2001 Sampling Date**	Original Atrazine (ppb) **2001 Atrazine (ppb)**	Original Total Cl-triazine (ppb) **2001 Total Cl-triazine (ppb)**	Well Use	Well Depth (ft)	Karst Yes/No	Remarks & data for 1994-2000	Distance to Field (ft)
17491-KS-017	06/14/94 **3/19/01**	5.1 **2.20**	6.2 **3.70**	OTH	35	No	Confirmed point source	75
17491-KS-068	11/30/94 **3/18/01**	3.8 **0.21**	4.5 **0.54**	D/O	78	No	Sandy soils	150
17491-MN-003	08/23/93 **3/18/01**	3.4 **2.30**	5.6 **5.21**	D/O	285	Yes	Karst	70
17491-WV-033	09/13/93 **3/22/01**	4.2 **0.86**	6.3 **2.39**	OTH	160	No	silt loam	2640
17491-IN-050	8/19/93 **3/19/01**	9.1 **0.05**	11 **0.25**	DOM	18	No	Sealed* 4/96	150
17491-WI-080	11/24/92 **3/20/01**	4.3 **0.16**	6.4 **1.94**	DOM	60	Unknown	Atrazine < 3.0 ppb since 1995	Unk
17491-WI-045	10/13/92 **3/20/01**	12.0 **2.20**	19 **4.14**	DOM	150	Yes	Sandy	50
17491-WI-060	10/28/92 **3/20/01**	7.0 **1.90**	13 **5.46**	DOM	95	Yes	Sandy	40
17491-WI-084	12/1/92 **3/18/01**	2.3 **0.08**	13 **4.59**	DOM	46	Sandy		850
17491-WI-092	12/7/92 **3/19/01**	1.0 **0.51**	12 **6.36**	DOM	75	Yes		100
17491-WV-019	8/9/93 **3/22/01**	0.96 **0.52**	12 **7.21**	DOM	140	Yes	silt loam	80
17491-WV-039	9/14/93 **3/22/01**	0.69 **<0.05**	14 **1.02**	OTH	20	Yes	Sealed* 3/01	300
17491-PA-105	6/28/93 **3/22/01**	1.4 **0.17**	15 **6.04**	D/O	240	Yes		15
17491-PA-106	6/28/93 **3/22/01**	1.7 **0.19**	14 **4.56**	DOM	160	Yes		35

DAR = Deethylatrazine to Atrazine Ratio; D/O = Domestic or Other; DOM = Domestic; OTH = Other.
*Sealed = A nearby well sampled in 2001 if original had been sealed and no longer available for sampling

Based on site investigations and the declining residues at these sites Syngenta concludes that high levels of chloro-triazines were predominantly due to point source contamination. Therefore we believe that these isolated values should not be used for general risk assessments.

2. Page 24: The revised preliminary risk assessment stated that "…only one sample was taken per well, and it cannot be known whether this one sample represents a maximum, a minimum, or some sort of average concentration value for atrazine residues in those (rural) wells. This is a major source of uncertainty for the risk assessments conducted for rural wells."

   In response to that comment, Syngenta identified a published report of a study on the temporal variability of atrazine in private well water (P. Pinsky, M. Lorber, K. Johnson, B. Kross, L. Burmeister, A. Wilkins and G. Hallberg. Environmental Monitoring and Assessment 47: 175-195 and 197-221, 1997). In this study, six hundred and eighty-six private wells in Iowa were monitored for atrazine and nitrate, of which eighty-three were selected for quarterly, monthly, weekly or even daily sampling. These 83 wells were selected for temporal study based on positive detection of atrazine and nitrate in the well water. The report indicated there was little seasonal variation of average atrazine concentrations in these private wells and suggested that, while a sampling scheme which takes frequent samples from the same population of wells will likely increase the number of wells identified as 'positive', the average concentration in these positive wells is likely to be <u>lower</u> than the average concentration in wells found positive in a one-time sample study like the Syngenta Rural Well study.

3. Page 63: Re-sampling of rural wells has been conducted in more than 100 wells across 10 different states within 48 months to assess temporal variation. The re-sampling results indicated that over 85% of the re-sampled wells had either the same or lower concentrations of atrazine and chloro-triazines. More significant declines in total chloro-triazines were noticeable over a longer period of time (2-3 years) between sampling, as would be expected following rate reductions and implementation of BMPs. Syngenta will provide a written summary of the data from the re-sampled wells.

4. Page 81: The highest measured (chloro-triazines) concentration from any well in the Syngenta Rural Well Survey was 19 ppb. Follow-up investigations indicated the presence of point source contamination accounting for the higher than expected levels of chloro-triazines in this well. Furthermore, among the 6 wells with atrazine < 3 ppb but with total chloro-triazine greater than or approaching 12.5 ppb, some of the wells had re-sampled results showing both reduced atrazine and total chloro-triazines concentrations well below 12.5 ppb (e.g., 17491-WI-084 and 17491-WI-092) (Table 6).

   In addition, the data from this rural well survey represent rare, worst case, high-end exposure scenarios because these wells were selected based on previous detections of atrazine and/or are located in high atrazine use areas where ground water is hydrogeologically vulnerable.

In the response to the Syngenta 30-Day Comments, EPA stated that the Syngenta rural well data should be applicable to a risk assessment for the 11,122 CWSs in the 17 major use states sourcing groundwater because the mean atrazine concentration from the Population Linked Exposure (PLEX IV database) for the same CWSs is comparable (0.154 ppb) to the mean atrazine concentration calculated from the Syngenta rural well study (0.152 ppb). Syngenta disagrees with the conclusion drawn from the comparison of two mean values.

Both the PLEX and the RRW groundwater data sets do not follow normal (Gaussian) probability distributions, and hence cannot be adequately described by means and standard deviations. The reasons for this are twofold: First, large portions of the data sets are censored due to technical/analytical constraints. For the PLEX data set, for example, about 97% of the data points were reported below LOQ, with LOQ's ranging from 0.1 to 3.0 ppb, depending on the state and year. These non-detects were replaced by ½ LOQ before the concentration mean was determined. The resulting mean value will therefore represent one half of the average LOQ's used, rather than a true measured mean of the population. Second, environmental data, like groundwater monitoring data sets, are not usually normally distributed, but follow log-normal or comparable distribution types. The reason for this is that the entities measured are not linear combinations of normally distributed properties (as Kd, groundwater recharge rate, half-life, etc.), which would generate normally distributed data sets. Measured entities are typically data responding in a nonlinear fashion – the resulting data sets tend to follow log-normal or similar distribution types, as is the case for PLEX and RRW.

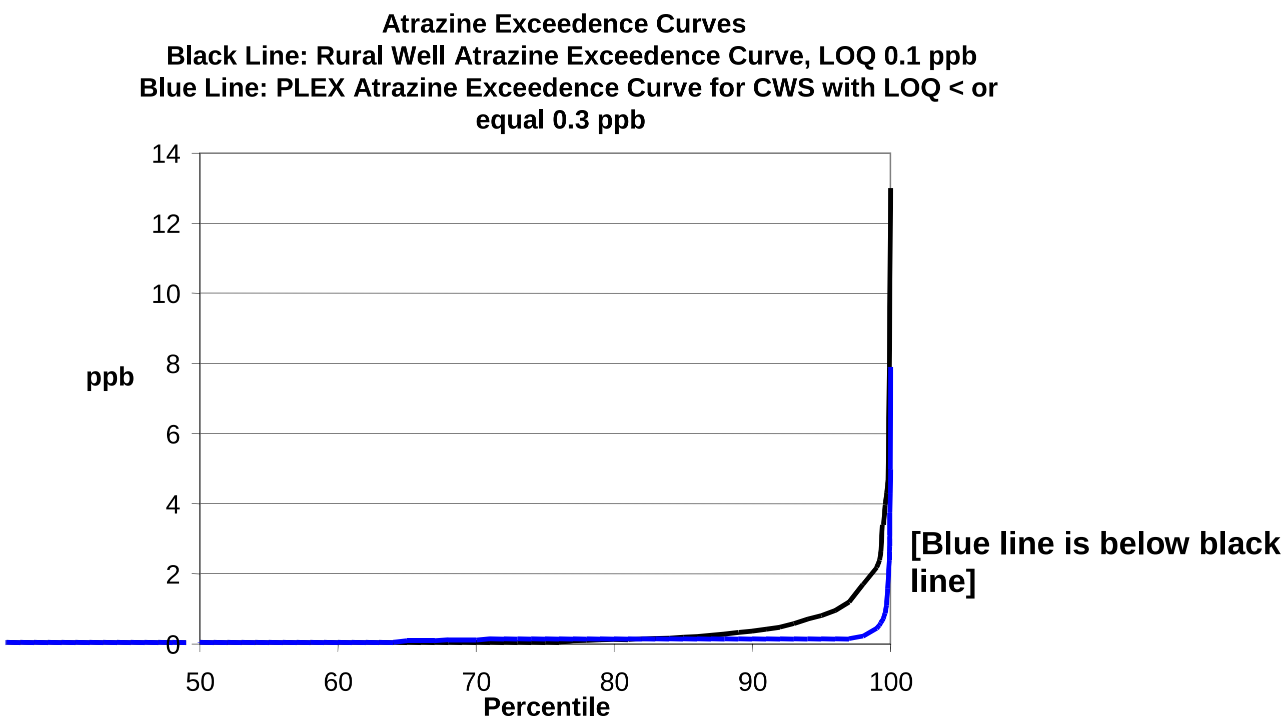
The type of distribution that applies to a given population and the constraints need to be known before parameters, like means, medians, and percentiles, are estimated and comparisons between groups of data are made. After the distribution type has been analyzed by appropriate statistical tests (e.g. the Chi-square test, the Kolmogorov-Smirnov test, or the Anderson-Darling test), the parameter estimates and the appropriate test for group comparisons (e.g. parametric or non-parametric) can be selected.

If the analysis is done for the atrazine parent concentrations in PLEX and the RRW study it becomes obvious that the mean value is not an adequate parameter to estimate similarity or dissimilarity of these data sets.

The distribution of the rural well data is clearly different from PLEX in the higher concentration range, i.e., the rural well data are more strongly biased to higher concentrations due to its worst-case study design. For example, nearly 98% of wells in the PLEX data were in the low concentration range (< 0.5 ppb). This same sub-population for atrazine in the rural well study was 93%. The maximum atrazine concentration observed in the rural well study was also much higher than in the PLEX database. Since mean concentrations for non-detection samples (<LOQ) were estimated with 1/2 LOQ and since the population of the non-detects were dominant the population mean of all samples could be subject to significant influence from the LOQ levels in the two databases. The LOQ in the PLEX CWS data of the major 21 atrazine

use states ranged from 0.1 to 3.0 ppb with 97% below the LOQ, while the LOQ for the Syngenta rural well study was always 0.1 ppb with only 78% below the LOQ. As mentioned earlier, the higher LOQ levels in the PLEX database and the higher relative proportion of samples below the LOQ inflate the calculated population mean concentration. A graphical comparison between CWS in PLEX with LOQ's below or equal 0.3 ppb to rural wells (LOQ 0.1 ppb) is presented in Figure 3.
It is obvious that both data sets differ significantly if compared at comparable LOQ's.

Figure 3: Comparison of PLEX and RRW upper atrazine concentration percentiles.



For these reasons, the Syngenta rural well data are not appropriate for a regional/national scale population-based groundwater exposure assessment in CWS on Groundwater.

Comparison of the Syngenta Rural Well and Groundwater CWS Studies

The following tables and figures demonstrate that there are three distinct sub-populations using groundwater sources of drinking water that should be considered in exposure assessments as follows:

1. Population using rural wells as their source of drinking water
2. Population on Community Water Systems using groundwater where there has been a history of previous atrazine detections
3. Population on Community Water Systems using groundwater where no atrazine has been detected

The analyses were done comparing the total chloro-triazine data from these groups. Non-detections were treated as follows:

For the Rural Well study, where 23% of samples had detections of atrazine, ½ the LOQ of 0.1 ppb (0.05 ppb) was assigned for each analyte where there was no detection. For both strata of the Groundwater CWS study (previous history of atrazine detection and no history of detection), the direct measured value from the instrument for each analyte, corrected for recoveries less than 100% and uncensored for the LOQ of 0.05 ppb, was used.

All three groups are not normally distributed and total chloro-triazine residues (including simazine) differ significantly (P=<0.001 for group medians and P<0.01 for difference of ranks).

Table 7. Comparison of the Three Groundwater Population Groups

Normality Test: Failed (P = <0.001)

Group	N	Missing	Median	50%	95%
CWS detect	204	0	0.124	0.124	1.307
CWS non-detect	235	0	0.00800	0.00800	0.0840
RRW Study.	1820	0	0.200	0.200	3.630

H = 741.530 with 2 degrees of freedom. (P = <0.001)

The differences in the median (see Table 7) values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference (P = <0.001)

To isolate the group or groups that differ from the others, Dunn's multiple comparison procedure was used (Table 8).

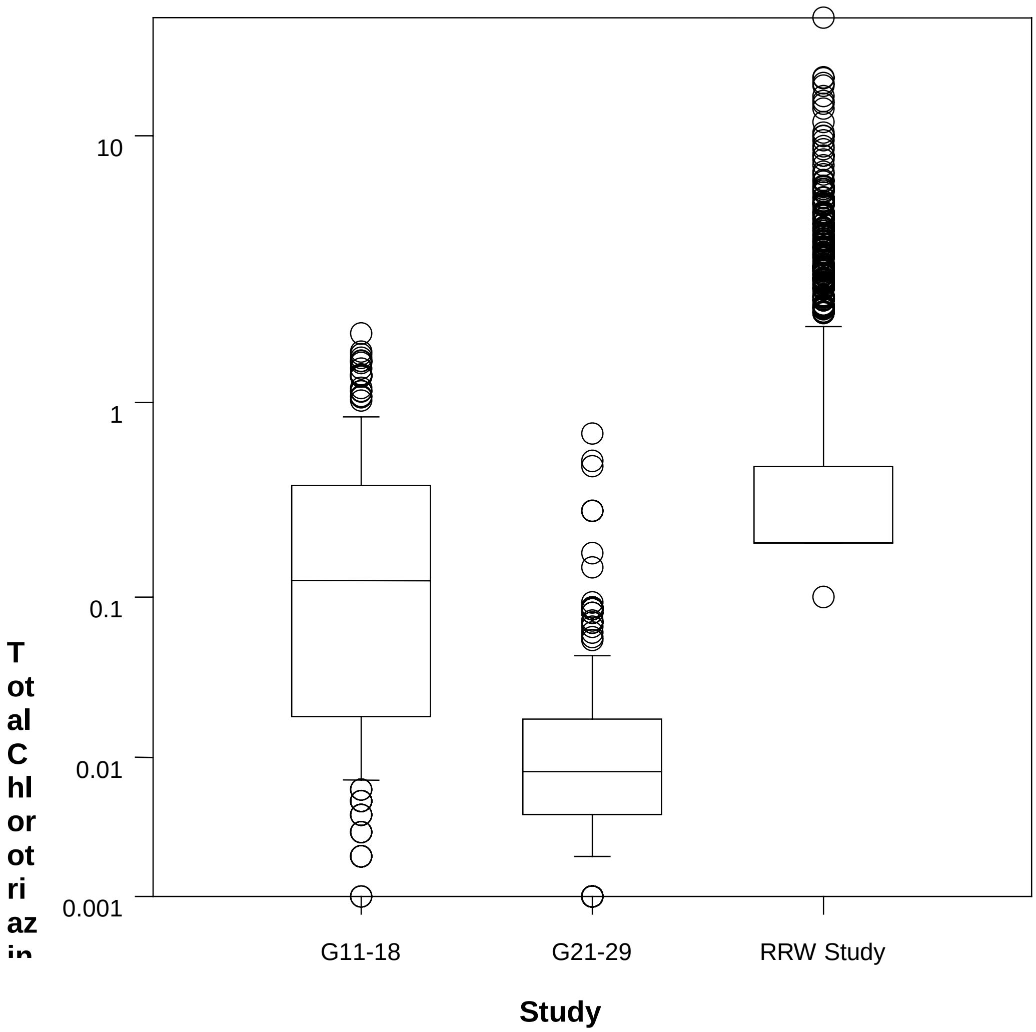
<u>Table 8. All Pairwise Multiple Comparison Procedure (Dunn's Method)</u>

Comparison	**Diff of Ranks**	**Q**	**P<0.01**
RRW Study vs CWS non detects	1104.795	24.436	Yes
RRW Study vs CWS detects	440.224	9.141	Yes
CWS detects vs non-detects	664.571	10.647	Yes

Note: The multiple comparisons on ranks do not include an adjustment for ties.

To illustrate this further, Figure 4 graphically compares the data from these three population groups.

Figure 4. Multiple Comparison of GW CWS Domains
CWS w previous detecs:
CWS w/o previous detects:
NCP Rural Well



Together these analyses strongly suggest that risk assessments should be conducted separately for these three population groups.

Groundwater Temporal/Spatial Variability

The Syngenta Rural Well and Groundwater Community Water System studies, the only studies with data for atrazine, simazine and all of their chloro-triazine metabolites, were generally sampled only at one point in time. Therefore, one of the direct comparisons that cannot be made in these data sets relates to the extent of temporal variability of chloro-triazine residues at specific well locations within a domain relative to the spatial variability over all well locations in the domain.

In principle, two extreme cases can be differentiated:

a) If e.g. there is no (or random) variation with time at all sites, but significant variation between sites, the most efficient study design would be to sample many sites once.
b) If there is no (or random) variation in between sites, but significant variation over time, the most efficient study design would be to take many samples over time at a site.

Ideally, an efficient survey study design should account for all major sources of variation in a data set with appropriate stratification for the predominant factors. In cases where no a priori information on major sources of variation is available, as is the case for the total chloro-triazine concentrations, information from closely related data sets and/or a weight of evidence approach can be used to evaluate suitability of study designs to meet the assessment objectives.

There is ample evidence that the major source of variation in residues in a groundwater data set is the spatial rather than the temporal variability.

To substantiate this for atrazine specifically, Syngenta analyzed the USGS NAQWA groundwater data set with the intent to identify significant sources of variation:

This data set contains residue data for atrazine and DEA. A two way Analysis of Variance was conducted for all 572 Stations with at least two samples in different quarters between 1992-96. For the few sites where more than one sample was collected within a quarter, the mean value of all results was determined and used to represent the quarterly concentration.

The ANOVA for each data set was conducted using three different detection methods (DM) for results below the LOQ:

- DM A used half the LOQ
- DM B randomly assigned values between 0 and the LOQ
- DM C used log transformed data obtained with DM B for data below the LOQ and the measured values exceeding the LOQ.

For the NAQWA data set the analysis was performed for atrazine alone and for combined atrazine and DEA concentrations, resulting in a total of six cases. ANOVA results were independent of the case. Uniformly it is found that the difference in the mean values among the different sites is greater than would be expected by chance after allowing for temporal effects, i.e., there is a statistically significant difference ($P = <0.001$). On the other hand, the difference in the mean values among the different levels in time is not great enough to exclude the possibility that the difference is just due to random sampling variability after allowing for the effects of differences in sites. There is not a statistically significant difference ($P = 0.217 – 0.805$, depending on case).

These findings are in agreement with a study on the temporal variability of atrazine in private well water referenced earlier (P. Pinsky, M. Lorber, K. Johnson, B. Kross, L. Burmeister, A. Wilkins and G. Hallberg. Environmental Monitoring and Assessment 47: 175-195 and 197-221, 1997).

Table 8-1 of the Drinking Water Exposure Assessment dated January 23, 2001 provided percentile values of atrazine in groundwater based on an ARP Groundwater Monitoring Study for the period from May 1995 to March 1998. The numbers could not be verified for accuracy because Syngenta does not have access to the ARP groundwater database. However, Syngenta believes that a more rigorous statistical comparison should be made between the concentration variability already contained in the 1,505 rural wells and the temporal variations in the ARP data. Moreover, EPA should evaluate the temporal fluctuations versus spatial variability (i.e., among wells) within the entire ARP data set.

ARP provided Syngenta with a courtesy copy of the 1999 ARP groundwater data for atrazine. While there are temporal variations up to a factor of five (½ order of magnitude) between the highest and the lowest chloro-triazine concentrations measured at the site with the highest temporal variation, there are significantly greater variations (up to two orders of magnitude) between sites sampled in the same time interval.

Furthermore, it should be noted that vulnerable, shallow agricultural monitoring wells – as the ones selected for ARP – are more prone to temporal variations than CWSs, which are usually served by deeper, less vulnerable wells or aquifers. The degree of variability seen in ARP is therefore considered to overestimate potential variability in CWSs on groundwater.

The conclusion that spatial variability is the predominant driver of variation in groundwater data sets is further supported by the following facts:

The occurrence of residues in groundwater depends upon:

a) the geo-hydrology of aquifers: it determines how fast a product would reach the aquifers and how fast it would be distributed within the aquifer;
b) the product use pattern/use history (one time use versus continuous use): determines if occasional peak values would be observed or if the concentration would be more in a steady state situation;
c) the product's environmental fate properties (stability, mobility): increasing stability and decreasing mobility will make temporal variations less likely since transport would be slow and at continuous (low) levels.

The first factor will contribute to spatial, the latter two to temporal variability.

For a compound like atrazine, which has been consistently used for 40 years in the major use areas and can be characterized as moderately persistent and mobile, one would expect the temporal variation of chloro-triazine residues to be small compared to site specific effects. Analysis of the variance obtained from the NAQWA data sets bears out the expectation that the spatial variability will be the predominant source of overall variability in the Syngenta Groundwater CWS study strata. An upper percentile from any of the two strata is therefore judged to conservatively represent potential chronic exposure to chloro-triazines through drinking water generated by CWS pertaining to the stratum in question.

<u>Groundwater Risk Assessment</u>

Based on the groundwater discussions above, and Syngenta studies , with measurements of total chloro-triazines, adequate data are available are adequate to use in groundwater drinking water risk assessments. Syngenta will request a meeting to discuss risk assessment methodology.

Community Water Systems Using Ground Water

CWS were divided into two groups: those with previous atrazine detections and those with no history of atrazine detections.

- Persons served by CWS in the "previous detects" category were theoretically exposed at the 95th Percentile determined for the "detects" stratum at: $\leq$ 1.47 ppb or $\leq$ 1.57 ppb for the population of CWS or the population of persons served, respectively.
- Persons served by CWS in the "previous non-detects" category were theoretically exposed at the 95th Percentile determined for the "non detects" stratum at: $\leq$ 0.09 ppb for both the population of CWS and the population of persons served.

Discussions should include methodology on how to assess the CWSs that were not monitored in the 21 major use States, covering 90% of total atrazine use, along with those in the remaining States.

Because the Safe Drinking Water Act (SDWA) requires monitoring for atrazine in all areas determined to be vulnerable, using the assessment for the “previous non-detects” category would provide a very conservative estimate of exposure.

To analyze those remaining minor use States, Syngenta obtained the SDWA data for ten additional States, which in combination with the 21 major use states now account for 99% of atrazine use. Since 1993, the number of CWSs with previous detections (on a percentage of total monitored CWS) is much less than those with detections in the 21 major use States. This indicates that overall exposure in these ten States would be much less than that determined for the 21 major use States, approaching the exposure determined for the “non-detect” category.

For the remaining 19 States, representing less than 1% of total atrazine use, the majority of exposure is expected to be lower than that of the “non-detect” category.

Rural Wells

The Syngenta rural well studies for atrazine and simazine showed that, even in the most sensitive areas of the 21 major use States, atrazine was detected in 340 of the 1505 drinking water wells. In only seven of the 1505 wells did total chloro-triazine residues exceed the 12.5 ppb DWLOC in 92-95. Today the total chloro-triazine concentrations in all seven wells are lower than 7.3 ppb (0.54-7.21 ppb). Using the same previous detect or non-detect logic as for the CWS, all seven wells were in the population of wells where atrazine was detected and represent only 2.1% of those wells. In no case where atrazine was not detected previously did total residues exceed 12.5 ppb.

Syngenta summarized in the PLEX update VI in 1998 several rural well monitoring programs that had been conducted in the 21 major atrazine use States. Of 16,382 rural wells that had been monitored, 14,974 (91.4%) had no detects of atrazine and 1,408 (8.6%) had detects of atrazine.

Based on the results of the Syngenta rural well study, which focused on the most sensitive areas, none of the 14,974 non-detect wells would be expected to exceed 12.5 ppb total chloro-triazines. Of the 1,408 wells in which atrazine was detected, a very conservative estimate would conclude that a maximum of 30 wells could potentially exceed 12.5 ppb, based on levels reported in the rural well study report for the 92-95 time period. This assumes that all of the 1,408 wells are drinking water wells (some of the wells, however, are for monitoring only). In fact re-sampling of the rural wells demonstrated that the levels of chloro-triazines in these wells have declined since the initial studies were performed. If these levels are used, no rural well would exceed 12.5 ppb.

Since monitoring studies have covered the sensitive areas of the 21 major use States, rural wells in other areas of these States should be similar to those in the non-detect group and the risk of exposure to chloro-triazine residues above 12.5 ppb should be nearly zero. This is also true for rural wells in the remaining 29 States.

Comments on the Agency's Citation of the Laboratory, Aerobic Soil Metabolism Half-Life Values

In the Agency's January 23, 2001 document entitled "Drinking Water Exposure Assessment for Atrazine and Various chloro-triazine and Hydroxy-triazine Degradates," the EPA notes on page 6 that the aerobic laboratory half-life value of atrazine is 3 to 4 months. This half-life value is further noted to have been derived from "…several aerobic soil laboratory studies…" However, the reference(s) for these studies is not provided.

On November 23, 1994, the EPA began the Special Review by publishing "Atrazine, Simazine And Cyanazine; Notice of Initiation of Special Review" in the Federal Register (EPA, 1994). This notice indicated that even though ecological effects were not a trigger in the Special Review, which was based upon human health concerns at that time, the EPA was nonetheless concerned about atrazine residues "…because they may have the potential to cause effects on aquatic organisms and terrestrial plants and their ecosystems."

To address the concerns of the EPA, and to respond to the request for additional information, Syngenta formed a multi-disciplinary expert panel to conduct a comprehensive and updated ecological risk assessment of atrazine. The assessment would build upon the existing atrazine ecological risk assessments (Solomon, et al., 1996; Fairchild, et al., 1994) incorporating data collected through 1999. The panel, named the Atrazine Ecological Risk Assessment Panel, was comprised of ecotoxicologists, environmental chemists, and modelers from academia and independent consulting organizations in the United States and Canada. In response to the needs of the Panel, Syngenta conducted a review of pertinent physicochemical and environmental data of atrazine to provide the Panel with a more accurate and reliable data to be used for higher tier modeling of atrazine. The Panel's report (Giddings, et al., 2000) summarized the environmental fate data on atrazine based on extensive literature search and review of in-house data available from Syngenta. The following information concerning the aerobic soil metabolism of atrazine is excerpted from the Panel's report.

Aerobic Soil Metabolism Half-Life Value (Laboratory)

Extensive research has been performed over the past thirty plus years to determine the fate and persistence of atrazine. Approximately seventy references, including studies available in the public domain, summaries, books, and unpublished studies, were evaluated for potential data on the transformation of atrazine. Research performed on soil in a controlled, laboratory environment under similar experimental conditions was the focus of the search. Six studies, representing ten unique atrazine half-life values, were considered representative of the dissipation of atrazine. These values are presented in Table 9. Numerous studies were not considered for the following reasons; extremes in experimental conditions, e.g., temperature and soil moisture; the soil was fabricated in the lab (vs. field collected); the soil was amended with bacterium or an energy source; the study was an outdoor, field study; or, the analytical procedure, extraction method, and/or, detection limits did not generate acceptable results. The half-life values in Table 9 ranged from 20 to 146 days with a mean value of 44 ± 38.6 days.

If two or more laboratory values are available, the USEPA uses the following equation to calculate a conservative half-life value for use in exposure modeling (USEPA, 1995):

(Equation 1) $t_{1/2}$ (days) = $x + t_{90}[\sigma/(n)^{1/2}]$

in which $t_{1/2}$ is the half-life in days used in the model, x is the sample mean in days, t_{90} is the *t*-test value at 90% confidence, σ is the sample standard deviation, and *n* is the sample size. Calculations are performed on the half-life as opposed to the rate constant (day^{-1}). The resultant approaches the mean as the sample size increases. Decay rates in surface soils were calculated using reported aerobic soil metabolism half-lives for the ten values summarized in Table 9. Using the t-test equation, the aerobic soil metabolism half-life was estimated as 61 days.

Summary

Syngenta Crop Protection recommends that EPA use the mean aerobic soil metabolism half-life value of 61 days that was reported by the Atrazine Ecological Risk Assessment Panel in their Expert Panel Report (MRID# 45299501). Syngenta requests the use of this value instead of the value noted in the Agency's January 23, 2001 document entitled "Drinking Water Exposure Assessment For Atrazine And Various Chloro-Triazine And Hydroxy-triazine Degradates."

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Table 9. Aerobic Laboratory Soil Metabolism

SOIL TEXTURE CLASS	SOIL SERIES	SOIL ORIGIN	% SOIL MOISTURE[a]	SOIL PH	% SOIL OM	STUDY TEMP (°C)	STUDY RATE (PPM)	HALF-LIFE (DAYS)	REF.
Sandy Loam	Hanford	CA	12	6.05	0.74	25 ± 1	10	26.6	Singh, 1990
Loamy Sand	Tujunga	CA	4	6.3	0.57	25 ± 1	10	22.9	Singh, 1990
Silt Loam	Falaya	TN	80 (FMC @ 1/3 bar)	5.5	0.66	25	5.6	21	Winkelmann, 1991
Silt Loam	Falaya	TN	80 (FMC @ 1/3 bar)	5.5	0.66	25	1	20	Winkelmann, 1991
Sandy Loam	Cape Fear	NC	80 (FMC @ 1/3 bar)	5.3	5.1	21 ± 2	1	59.3	Blumhorst, 1994
Loam	Les Evouettes	Switzerland	75 (FMC @ 1/3 bar)	6.8	6.38	20	10	56.4	Abildt, 1991
Loam	NR	CA	75 (FMC @ 1/3 bar)	7.6	1.4	25 ± 1	10.2	146	Nelson, 1991
Silty Loam	NR	Germany	60 (MWHC)	5.1	2.2	25	5	39.4	Qiao, 1996
Silty Loam	NR	Germany	60 (MWHC)	7.6	1.8	25	5	24.9	Qiao, 1996
Sand	NR	Germany	60 (MWHC)	4.1	3.8	25	5	23.8	Qiao, 1996
							Mean:	44	
							Std. Dev.:	38.6	
							N:	10	
							Median:	25.8	

[a] Soil moisture during incubation.
OM = Organic Matter.
NR = Not reported.
FMC = Field Moisture Capacity.
MWHC = Maximum Water Holding Capacity.

Attachment 7
THIS SECTION HAS BEEN REMOVED BECAUSE IT INCLUDES SYNGENTA DATA
Atrazine - Corn
Supporting Data for Amending Tolerances

Atrazine - Sorghum
Supporting Data for Amending Tolerances

Attachment 8

Syngenta Response to the USEPA “Review of Atrazine Incident Reports, DP Barcode D270014”

Syngenta Response to the USEPA "Review of Atrazine Incident Reports, DP Barcode D270014".

On 10/31/00, USEPA reviewed atrazine incident reports involving humans (DP Barcode D270014, Chemical # 080803). USEPA consulted five separate databases for information on incidents that allege atrazine as a causative agent. Atrazine incidents or summaries of incidents were obtained from the OPP Incident Data System (IDS), Poison Control Centers (PCC), California Department of Pesticide Regulations (CDPR), National Pesticide Telecommunication Network (NPTN), and from the scientific literature. Also a brief review of some epidemiology studies conducted with atrazine was included in the document.

The EPA incident review covered five separate databases containing incident data recorded for times frames up to 15 years. These databases cover all products containing atrazine, including atrazine that was formulated by many manufacturers and that was used alone or in mixture/sequentially with other pesticides. To show the magnitude of sources of atrazine, a 12/07/00 NPIRS search of federally active registrations showed 40 companies holding 171 primary name atrazine-containing products. This total does not include products that have been discontinued over the years the incident databases cover.

The Agency concluded that the "majority of cases [incidents] involved skin illnesses such as dermal irritation and pain, rashes, and welts and eye illnesses such as eye damage, blurred vision, conjunctivitis, irritation and pain" and were due to occupational exposure.

Overall, the total number of atrazine incidents is very low especially when considering the quantity of product that was handled over the years analyzed. If the number of applications of atrazine were factored into the incident analysis, it is clear that the risk of significant incidents involving humans is extremely low.

OPP Incident Data System (IDS)

The OPP database received a total of 45 incidents from a variety of sources (e.g., registrants, other federal and state health and environmental agencies and individual consumers) over an eight year period (1992 – 2000). Of the 45 incidents reported in the IDS, 22 involved dermal or ocular symptoms as the primary complaint. Dermal symptoms described in the incidents ranged from skin irritation to hypersensitivity to an incident alleging dermal burn. Ocular incidents ranged from irritation to one case alleging chronic conjunctivitis. The mild symptoms described in the reports are consistent with an overexposure to concentrated but not diluted forms of atrazine or products containing atrazine. The few incidents alleging more severe symptoms are not consistent with exposure to concentrated or diluted forms of atrazine or products containing atrazine.

All Syngenta products containing atrazine are categorized with the USEPA designated "Caution" signal word, indicating low levels of concern for skin and eye irritation. However, all of the labels clearly warn handlers to “avoid contact with eyes, skin or clothing”. The “Caution” categorization is based on GLP animal studies (Oral LD50, Dermal LD50, Inhalation LD50, Skin Irritation, Skin Hypersensitivity, and Eye Irritation studies) that are reviewed and approved by the Agency. Based on the animal studies with atrazine products, chronic eye irritation or dermal burns are not biologically plausible nor anticipated. Furthermore, it should be noted that pesticide signal words can range from “Caution” to “Warning” to “Danger” based on the results of the animal studies. Based on the favorable acute toxicity data, all Syngenta products containing atrazine are categorized with the most favorable signal word possible, “Caution”. Furthermore, atrazine and products containing atrazine are diluted with water before use which will further decrease the risk of dermal and eye irritation **(Note: the animal studies used to evaluate acute toxicity are conducted with undiluted product).** With dilution, all Syngenta products containing atrazine would likely be classified as practically non-irritating to skin and eyes.

Atrazine Formulation	**Signal Word**	**Dermal Toxicity ***	**Skin Irritation Category ****	**Eye Irritation Category ****	**Hypersensitivity**
Atrazine Technical	Caution	Slightly Toxic	Slightly Irritating	Slightly Irritating	Sensitizer
AAtrex Nine-O	Caution	Practically Nontoxic	Minimally Irritating	Mildly Irritating	Not a Sensitizer
AAtrex 4L	Caution	Practically Nontoxic	Mildly Irritating	Mildly Irritating	Sensitizer
Bicep Lite II Magnum	Caution	Slightly Toxic	Slightly Irritating	Slightly Irritating	Sensitizer
Bicep II Magnum	Caution	Slightly Toxic	Slightly Irritating	Mildly Irritating	Not a Sensitizer

* USEPA dermal toxicity categorization for pesticides can range from practically nontoxic to highly toxic.

** Skin and eye irritation categorization ranges from practically nonirritating to corrosive.

It should be noted that some formulations of atrazine contain other pesticides, and the EPA-designated signal word for the combination formulation may be influenced by the toxicological properties of the other pesticide. The atrazine component in the combination formulations, however, does not contribute to a potentially more restrictive signal word classification.

Because of the great diversity of the other symptoms alleged in the IDS database, it is difficult to organize the incidents where dermal and eye irritation were not the primary complaint. However, other allegations included general/nonspecific sicknesses (nausea, headaches, diarrhea), neurological symptoms (dizziness, memory loss, confusion), pulmonary symptoms (difficulty breathing, asthma exacerbation), and cardiovascular symptoms (tachycardia, cardiac arrest). Specific details of the incidents were not provided by the Agency, and this information is critical to establish the exposure and anticipated resulting symptoms or lack thereof. From a hazard analysis standpoint, overexposure to some formulations of atrazine could lead to nausea, headache, diarrhea, dizziness, confusion, difficulty breathing, and asthma exacerbation, but the exposure scenario and resulting dose would need to be extreme to cause any of these symptoms (e.g., consumption of concentrated product or use of concentrated product in enclosed area for an extended period of time with no personal protection equipment). Overexposure to this extent is unlikely considering that atrazine is applied as a diluted product according to labeled instructions.

With regards lung cancer, renal failure, arthritis, chronic neurological problems, cardiac arrest, burned eyes/skin, anorexia, and other serious claims of adverse effects alleged to be a result of exposure to atrazine, Syngenta denies these claims as being contrary to atrazine toxicological and epidemiological database. It should be noted that there are no real trends in these allegations, and the method of data collection should be taken into consideration; incident data is one of the weakest forms of scientific data. Causation is easily alleged, however the current understanding of the toxicological profile of atrazine clearly discounts each and every one of these claims. There is no scientific data to explain these incidents other than alternative causation.

Poison Control Centers (PCC)

Data collected from the PCC is difficult to analyze considering details of the specific incidents were not provided. Based on the incidents that provided details (IDS and Syngenta data), it is likely the majority of incidents contained in the Poison Control Centers data involved minor skin and/or eye irritation. PCC data spanning six years alleged four occupational, thirteen non-occupational, and two children-under-six cases categorized with “moderate or more severe symptoms”. Details of the allegations were not provided. PCC data indicated that no life threatening incidents occurred in occupational and children-under-six cases and one life-threatening incident occurred in the non-occupational cases. While Syngenta does not know the specific details of this single case, Syngenta denies atrazine is the causative factor on the basis of the favorable toxicological profile of atrazine.

Overall, the Agency’s presentation of the PCC data does not afford the opportunity for critical analysis, and any conclusions based on this data should be scrutinized or judged as unsupported. The methods for the tabulated values in PCC data should have been clarified by identifying the rationale and calculations utilized to establish the percentages of outcomes. Considering the small number of incidents categorized as “outcome determined”, more details should have been provided on the individual incidents. Additionally, each incident should be critically analyzed to rule out other possible causative factors and establish biological plausibility.

Other Sources of Incident Data

The fifteen and seven years of CDPR and NPTN incident data identified one and seventeen atrazine incidents, respectively, involving humans. This would equate to approximately 3 incidents per year. While the specific details of the incidents were not provided, the majority of the incidents likely involved minor skin and/or eye irritation.

The Agency indicated that “no significant literature citations were found concerning poisoning incidents due to atrazine”. Syngenta agrees that the scientific community has not recognized atrazine poisoning as an issue.

Syngenta also provides all 6(a)(2) incidents that it or its agents obtain to the Agency. In the years 1998, 1999 and 2000, Syngenta reported 24 human incidents. Of these 24 human incidents, sixteen were categorized as HD or HE, indicating the symptoms were minor or unknown/unspecified in terms of severity. The Agency categorizes an incident as HD if the person alleged or exhibited mild symptoms (e.g., skin rash, itching, conjunctivitis, drowsiness, transient cough, headache, stomach cramps, joint pain, agitation, restlessness, or mild gastrointestinal symptoms such as self-limited diarrhea, stomach cramps or nausea). Four of the 24 Syngenta human incidents were categorized as HC; the Agency categorizes an incident as HC if the alleged symptoms were more pronounced or prolonged than those described as HD but are not life threatening and the person returned to pre-exposure state of health. Three of the 24 Syngenta human incidents were categorized as HB, and all three were lawsuits filed by manufacturing facility workers; Syngenta denies all of the claims on the basis of biological plausibility and alternative causation. One incident was categorized as HA, and it was submitted to the Agency on 11/16/1998. In this incident, a person was exposed to drift of diluted atrazine. A few months later, he died of lung cancer and alleged the spray drift was causative. Syngenta denies this claim on the basis of biological plausibility and alternative causation.

Syngenta Conclusion

Overall, the total number of atrazine incidents is very low especially when considering the quantity of product that was handled over the years analyzed. If the number of applications of atrazine were factored into the incident analysis, it is clear that the risk of significant incidents involving humans is extremely low.

With regards to the skin and eye irritation incidents described in the Agency’s review, all Syngenta atrazine products are categorized with the signal word “Caution”, the most favorable signal word possible under FIFRA regulation. With regards to the other symptoms indicated in the incidents, it should be noted that atrazine has been extensively tested in animals, studied in epidemiological studies and scrutinized by the Agency, Scientific Advisory Panel and Cancer Peer Review Committee. Based on the information obtained from the extensive atrazine toxicological database and epidemiological studies, the symptoms claimed in these more significant incidents are due to alternative causes. With regards to oncogenicity, atrazine has been extensively tested, scrutinized with numerous epidemiology studies, and reviewed by the Agency that concluded atrazine should be categorized as “Not Likely a Human Carcinogen”. Atrazine’s favorable safety record is further confirmed by the small number of incidents that occurred over the years examined when compared to its extensive use.

Attachment 9

Agricultural Stewardship Activities

AGRICULTURAL STEWARDSHIP ACTIVITIES

Syngenta has developed and implemented a many-tiered, proactive approach to Environmental Stewardship, which includes the development of a comprehensive water monitoring program, two informative databases, and several cooperative educational and research projects and watershed programs. These were designed to improve the effectiveness of Best Management Practices (BMP's) and improve water quality. Syngenta has also assembled a literature review relevant to the design and effectiveness of BMP's. Below is a summary of the ongoing efforts that Syngenta supports in order to address agricultural stewardship issues.

1. Voluntary Monitoring Program with Selected Community Water Systems (CWS) in the United States for the Herbicide Atrazine

   In June of 1993, Syngenta initiated a voluntary atrazine monitoring program with 19 Community Water Systems (CWSs) on surface water in Illinois. The program was extended into other key atrazine use states over the past nine years. In 2001, there are 93 CWS in nine states (Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Missouri, Ohio and Texas) participating in the program.

   The program is designed to primarily monitor small impoundments (reservoirs) with unregulated flow structures located in agricultural watersheds. One objective was to obtain baseline seasonal and annual monitoring data on atrazine in these reservoirs used as drinking water sources. Historically, monitoring data for herbicides in these reservoir systems were very limited. This information would help identify special or unique watershed situations and help to target stewardship activities. A second objective was to obtain supplemental data with a sample frequency greater than the mandated minimum four quarterly samples under the Safe Drinking Water Act (SDWA).

   The expanded sample frequency varied from two per month for nine months to weekly during May – July to better characterize the annual variation in atrazine concentrations. Analysis was conducted with a triazine immunoassay method and gas chromatograph confirmation. Sample collection and shipment were conducted by each participating CWS. Annual reports are provided to each CWS. Program results are also provided to state and federal agencies.

2. Population-Linked Drinking Water Exposure Assessment (PLEX) for Community Water Systems (CWS) in 31 Major Atrazine and Simazine Use States

   A population-lined database was used to assess exposure to the herbicides atrazine and simazine in drinking water provided by community water systems (CWSs) in 31 major use states. Finished drinking water and population data were obtained annually from the state lead agency charged with administration of the Safe Drinking Water Act (SDWA) in each of the 31 states. Herbicide concentration and population data from 1993 through 1999 were paired for each CWS and aggregated for all CWS to construct state and multi-state exposure profiles. The assessed populations were 174 million for atrazine and 175 million for simazine. This information is used as a tool in safety assessments and used to focus the stewardship projects.

3. Water Monitoring Database

Syngenta committed to the design and implementation of a Water Monitoring Database for in-depth analysis of surface and groundwater sample information from internal and external sources. Already, 350,000 results have been loaded into the database encompassing:

- External SDWA data for 1993-99 from 31 states
- Syngenta Voluntary Monitoring Program data for CWSs
- Syngenta analysis of water samples from our research monitoring programs and other sources
- Acetochlor Registration Partnership data

The database is also able to store detailed information on Community Water Systems, Water Bodies, Water Treatment regimes, Watersheds, Land Use, and Stewardship activities. We are working to obtain access to EPA's Federal and State SDWIS to verify data accuracy and add new information, and are very interested in the EPA Pilot to obtain SDWA data from the states in one standard, electronic format.

4. Agricultural Stewardship Database

Syngenta committed to the design and implementation of an Agricultural Stewardship Database for the capture and summarization of detailed grower management practices (down to the individual field level), watershed characteristics, and environmental data in whole watersheds.

The database is able to store traditional management practices involving crops, tillage, and pesticide use, as well as structural and non-structural Best Management Practices at the watershed and farm level. Retrieval and summary functions are now being developed.

5. Macoupin County, Illinois Watershed Pilot Project

This project has been a cooperative effort between the Natural Resources Conservation Service (NRCS), Soil & Water Conservation District (SWCD), and Syngenta Crop Protection, Inc.

BMPs to reduce run-off have been identified through years of small plot and individual field research, but single practices implemented on one or a few farms cannot predict entire watershed effects. Therefore, Syngenta

Crop Protection funded the Macoupin County Watershed Pilot Project to obtain a detailed evaluation of how BMPs and other management practices interact with uncontrollable factors such as weather and soil texture to affect atrazine variations in the water source of these watersheds.

Macoupin County, Illinois was chosen for several important reasons. It is a key agricultural county in a key agricultural state and has rainfall and soil characteristics that are susceptible to run-off. Macoupin County has had a strong presence since 1994 in the Atrazine Voluntary Water Monitoring Program, and there is an excellent working relationship between SWCD, NRCS, and Syngenta Crop Protection.

Detailed information about management practices (crops/tillage/pesticides) over a 5-year period was collected from all growers in each of six watersheds (see below). Several thousand fields were characterized, and information is now being categorized as to its value and availability, for future watershed projects, regardless of product or state. A key goal is to determine if/how management practices in a watershed can be changed to impact atrazine variations in water.

In addition to collecting detailed field management information in approximately 300 individual grower interviews, SWCD and NRCS collected information on watershed, reservoir, and soil characteristics, land use, field water flow, and non-farm BMPs. These data have been entered into the Agricultural Stewardship Database and will be used to aid in the development of site-specific best management plans for individual watersheds.

Watersheds in the Macoupin County Watershed Pilot Project

Community Water	Watershed Size	Reservoir Size	Growers
System (Acres)	(Acres)	(Approx.)	
ADGPTV	12,990	765	70
Carlinville	16,700	160	100
Gillespie Lakes	7,800	340	70
Hettick	2,710	80	20
Mt. Olive Lakes	3,900	65	40
Palmyra-Modesto	990	36	18

4. Assessment of Best Management Practices in the Lake Springfield, Illinois Watershed

This project has been a cooperative effort between various organizations, including the USDA National Soil Tilth Laboratory, University of Illinois Extension, USDA-NRCS, the Illinois State Water Survey, the City of Springfield, the Lake Springfield Watershed Resource Planning Committee, and Syngenta Crop Protection.

The ultimate goal of this five-year Project is to improve water quality within Lake Springfield Watershed through the use of cost-effective best management practices. Specific objectives include: 1) a thorough understanding of the mechanisms that impact water quality within the watershed, 2) identification of BMPs that are practical, cost-effective and acceptable to the farming community, and 3) development and implementation of an action plan for utilizing these BMPs on a wide scale.

Understanding what is influencing water quality within this Watershed encompasses a wide range of research initiatives. Extensive data were generated on the herbicide, nutrient and sediment levels within the Watershed. Precipitation data were recorded throughout the Watershed. Stream levels were recorded and flows estimated in the Watershed. Contributions from field drainage tiles were also assessed. Data on field--by-field farming practices were also collected. Finally, work continues on integrating all of this information into an analytical tool (GIS) which will be used to assess existing conditions and to predict improvements in water quality through the application of specific BMPs. The assessment of BMPs has focused on field test plots of a variety of practices. Whole field evaluations are being added in the latter years of the Project.

Benefits of the project will be significant when the action plan for implementing BMPs is completed. Benefits will include reductions in soil losses, improved wildlife habitat, and overall water quality within the Watershed, along with more economically viable farming practices. An immediate benefit is the heightened awareness of water quality issues within and beyond this watershed, as a result of the various educational and outreach efforts associated with the project.

5. Trees Forever - Iowa Buffer Initiative

This project is being sponsored by Syngenta Crop Protection, Iowa Farm Bureau Federation, Iowa Department of Natural Resources, US-EPA, and NRCS. The Iowa-based, not-for-profit Trees Forever is committed to responsible, long-term stewardship of forests, water, land, and air. Ultimately, the five-year non-pesticide-specific project will contain 100 demonstration and project sites that showcase the many ways to establish and maintain buffers, show landowners the flexibility of buffers in improving water quality and reducing soil erosion in different soil types and terrain, create a network of buffer specialists, and recognize farmers who include buffers in their management plans. An outgrowth of the Iowa Buffer Initiative is the Illinois Buffer Partnership, which has the same goals and schedule.

6. Illinois Council on Best Management Practices

Syngenta Crop Protection is the corporate sponsor/member of this coalition, which was established in 1999 to coordinate current research to protect water quality in Illinois. The council, which also includes the Illinois Corn Growers Association, Illinois Farm Bureau, Illinois Fertilizer and Chemical Association, Illinois Pork Producers Association, and Illinois Soybean Program Operating Board, assists and encourages the adoption of non-pesticide-specific BMPs provides information and support to local watershed groups and cooperates with water quality initiatives.

7. Missouri Watershed Research, Assessment, and Stewardship Project (WRASP)

The Missouri Corn Growers Association, Missouri Department of Natural Resources, and Syngenta Crop Protection have formed a partnership to address the water quality problems in three watersheds on Missouri's 303(d) list. The watersheds of Smithville Reservoir, Monroe City South and Route J Reservoirs, and the Salt River tributary of Mark Twain Reservoir will be included in a five-year study, which will include watershed monitoring, reservoir water quality monitoring, and watershed modeling. The objective is to voluntarily develop and implement a Water Quality Management Plan for each watershed, which will also address the potential need for regulatory action should the effort not be successful.

8. Palmyra-Modesto, Illinois

Syngenta has sponsored a four-year (1998-2001) Best Management Practice's (BMP) study with the key growers in the watershed associated with the reservoir for the Palmyra-Modesto CWS in Macoupin County Illinois. The study's preliminary results (1998-1999) show the adoption of BMP based on (1) aeration in lieu of disking and (2) incorporation of soil applied herbicide in the spring increases the water infiltration capacity of soil with lower atrazine concentrations in the drain flow compared to surface runoff concentrations. These BMPs should lead to lower atrazine annual concentrations in the reservoir.

9. Environmental Solutions Program

This program has been designed by Syngenta to provide agricultural retailers with the tools needed to refine their growers' weed control programs while promoting local water quality stewardship. Both product-based solutions and Best Management Practices are considered in the environmental solution.

10. Stewardship Efforts at the Local Level

Syngenta Crop Protection has sponsored and/or participated in widespread and varied external activities relative to stewardship at the state, watershed, community water system, water body, and even individual grower levels. Water quality stewardship activities, BMP's, or educational programs have been conducted by Syngenta in 19 communities in Missouri, 17 communities in Illinois and several communities in Kansas, Nebraska, Iowa, Texas, Ohio, Kentucky, and Louisiana

11. Optimizing the Biodegradation of Atrazine and Related Compounds

This project has been a cooperative effort between the University of Minnesota and Syngenta Crop Protection, Inc.

Environmental stewardship has been a key goal and accomplishment over the course of this long-term research agreement with Professors Larry Wackett and Michael Sadowsky of the University of Minnesota. The major routes by which microbes transform atrazine and related triazine ring compounds have been discovered. The enzymes involved in atrazine dechlorination and subsequent metabolic steps have been identified, and research has been conducted using enzyme, either in isolated form or bound in cells, for remediation projects. Work in progress includes:

A. Natural and recombinant enzyme immobilization/stabilization experiments to develop the practical capability to reduce levels of atrazine in the environment, i.e. spills. The various atrazine chlorohydrolase enzymes are being further characterized as to their kinetics and stability. The stabilized, degrading enzymes could be used to detoxify compounds in soil and water remediation. Research has provided data supporting the idea that enzyme treatment is technically effective. It has been determined that whole cells can be cross-linked to impart greater stability to the enzyme for use as a product for remediation and rendering the cells non-viable.

B. Progress has been made on the stabilization and application of atrazine-degrading enzymes to soils for practical remediation at spill sites. A field test at Platte, South Dakota was completed in 2000, with the state and federal regulatory agencies allowing the enzyme-treated soil from a spill site to be spread on agricultural soil. The field test showed that cells expressing atrazine chlorohydrolase can be applied to soils containing high levels of atrazine resulting from a spill, to significantly speed up the rate of atrazine degradation in soil. Product development for practical soil treatment will be further investigated using immobilized cells, wild-type cells with better activity, and soil itself as inoculum to remediate soils.

C. Development of a method of detoxifying s-triazine compounds using transgenic plants in remediation projects. Research efforts have led to the expression of bacterial atrazine chlorohydrolase in alfalfa for the purpose of using plants in remediation. Due to its extensive root system, alfalfa could possibly be developed as an excellent remediation tool.

12. Progress in Best Management Practices

There is a large body of information and research which confirms the effectiveness of BMP’s. In addition to the literature cited below, there are numerous technical bulletins published by various sources which summarize results of various methods and document the benefits of BMP’s. Some examples of these would be: “Reducing Herbicide Runoff: Role of Best Management Practices,” Baker et al, 1995; “The Impact of Conservation Tillage on Pesticide Runoff into Surface Water: A Review and Analysis,” Fawcett et al, 1994; “Best Management Practices to Reduce Runoff of Pesticides into Surface Water: A Review and Analysis of Supporting Research,” Ciba-Geigy Technical Bulletin, 9-92; and “Conservation Buffers to Reduce Pesticide Losses”, USDA, March 2000.

The upcoming book <u>The Triazine Herbicides</u> (ed. by Homer LeBaron, Janis McFarland, and Orvin Burnside), includes the chapter “Progress in Best Management Practices” which deals specifically with a) the strong federal, state, private-sector and grower commitment to research on and implementation of BMPs, and b) the compelling research results indicating that various BMPs are effective in reducing the movement of soluble and suspended components, including atrazine, in water.

Portions of this chapter are excerpted or paraphrased below:

In 1989, the Board on Agriculture of the National Research Council was asked to convene a committee to assess the science, technical tools, and policies needed to protect soil and water quality while providing for the production of food and fiber from US croplands (NAS 1993). Their report, entitled “Soil and Water Quality: an Agenda for Agriculture”, defined four broad and interrelated approaches that held the most promise for preventing soil degradation and water pollution, while sustaining a profitable agricultural sector. They recommended that programs seek to (1) conserve and enhance soil quality as the fundamental first step to environmental improvement; (2) increase the resistance of farming systems to erosion and runoff; (3) increase nutrient, pesticide, and irrigation use efficiencies in farming systems; and (4) make greater use of field and landscape buffer zones.

Conservation tillage has grown from 26% of annually planted acres in 1989 to 37% of acres in 1998. In response to the CRP of the 1985 Farm Bill, some 31.3 million of the statutory 36.4 million A of farmland, a large percentage of which was environmentally sensitive, has been placed into grassland, trees, wildlife habitat, and conservation buffers in one of the most beneficial conservation programs in US history. The addition of a continuous sign-up provision to the CRP in the 1996 Farm Bill has resulted in the establishment of about 612,000 miles of conservation buffers since the launch of an NRCS conservation buffer initiative in 1997 (USDA-NRCS 1999). In response to the continuous sign-up program, USDA has established a goal to sign-up 2 million miles of conservation buffers by the year 2002. This projection excludes miles have been established under US-EPA Section 319 and Partners for Wildlife programs.

In addition to the above federal programs, states have appropriated about $1 billion for conservation initiatives. These cost share, incentive, and quasi-regulatory programs are resulting in increasing adoption of Land and Input Best Management Practices. The most important of these for soil, water, and wildlife quality are conservation tillage, field and vegetative buffers (conservation buffers), wetland restoration, nutrient management, and integrated pest management.

The private sector is demonstrating its concern for soil and water quality by active involvement in the CTIC public/private partnership and the National Conservation Buffer Council, both established for the marketing of BMPs. As a result of the ‘Know Your Watershed Program’ initiated by the Conservation Technology Information Center (CTIC) in West Lafayette, Indiana, some 1,200 active watershed partnerships have been identified and captured on a National Watershed Network Database at the CTIC. This database provides a tremendous tool to promote and track the adoption of BMPs.

Grower concern for soil degradation and erosion has been demonstrated by the rapid adoption of conservation tillage and no-till within the US. Crop residue management with conservation tillage rapidly became the preferred method (83%) of soil erosion reduction in conservation compliance plans on highly erodible farmland. From 1989 to 1998 conservation tillage grew from 26% of annually planted cropland acreage to 37% of these acres, a growth of 37.5 million A. In this time frame, no-till crop production grew from 14 million A to 48 million A. The rapid adoption of these practices between 1989 and 1994 reduced cropland erosion (sheet, rill, and wind erosion) from an average of about 8 tons per acre per yr in 1982 to about 5.2 tons/acre/per yr in 1995 (USDA-NRCS 1992; USDA-NRCS 1998).

The research effort on BMPs has expanded greatly in recent years, proving that BMPs are effective in reducing the movement of soluble and suspended components in water.

A laboratory simulation of 3000 plants per square mile indicated that contour grass strips reduced sediment concentrations to at least 1/3 of that from bare soil on 5 to 10% slopes (Ligdi and Morgan 1995). The first 3 m width of an 18.3 m bromegrass filter strip reduced sediment runoff by more than 70%, and a 9.1 m width reduced it by 85% (Robinson et al. 1996). Comparisons of 4.6 and 9.1 m filter strips of orchardgrass (Dillaha et al. 1989) and fescue (Magette et al. 1989) showed that 70% and 84% (orchardgrass), and 52% and 75% (fescue), of sediment was trapped, respectively. Mickelson and Baker (1993) obtained only a slightly higher percent reduction in sediment (72% to 76%) by increasing the grass filter from 4.6 to 9.1 m. While trapping of total suspended solids (TSS) increased with filter strip width, the increase in performance decreased exponentially, with the average TSS trapping efficiency for 2, 5, 10, and 15 m strips equal to 0.50, 0.72, 0.86, and 0.87 wheat, respectively (Lalonde et al. 1998). Other experimental results on sediment retention and grass filter strip width include 90% retention with 0.6 and 4.9 m strips (Neibling and Alberts 1979), 40% to 80% and 72% to 95% with 1.5 and 3 to 6.1 m strips, respectively (Line 1991), and 81% and 91% with 4.6 and 9.1 m strips, respectively (Dillaha et al. 1987).

Barone et al. (1998) concluded that most sediment trapping occurs within the upslope portion of the filters and that the subsequently small differences in sediment trapping efficiencies for 4.3 and 8.5 m filters (2%) might not justify the additional costs. One reason that there does not always appear to be a direct relationship between strip length and effectiveness is that longer strips intercept a larger amount of rainfall which, when greater than the infiltration rate, may result in greater runoff from longer strips.

More than 75% of the sediment was trapped by the riparian zone in a North Carolina watershed, with >50% within 100 m of field edge (Cooper et al. 1987). Total sediment decreased through both grass and riparian filters from 60% to 90% in the North Carolina Piedmont, across a wide range of natural rainfall (Daniels and Gilliam 1996).

The simulation involving contour grass strips composed of sheep fescue or Kentucky bluegrass indicated significant differences in soil loss due to greater root density and interwoven stems and leaves of the former (Tadesse and Morgan 1996). The authors hypothesized that, based on the pattern of deposition, the main effect of the fescue barrier on the steeper slopes was to filter sediment, whereas on the gentler slopes the main effect was to pond the runoff and, thereby, increase infiltration and reduce runoff volume. Strips decreased flow rate and transport capacity of runoff (Dillaha et al. 1987), increasing infiltration, sedimentation, filtration of suspended material, adsorption to plant and soil surfaces, and absorption of solutes by vegetation.

The degree of submergence of the grass also influences sediment and water output of the runoff (Wilson 1967). Sediment retention decreases significantly when grass is submerged (Neibling and Alberts 1979; Magette et al. 1987; Vuurmans and Gelok 1993). High volume flows commonly overwhelmed both grass and riparian filters (Daniels and Gilliam 1996).

Concentrated flow must be minimized, by using techniques such as accurately following the contours, to realize the benefits of filter strips (Dillaha et al. 1989). The age of the grass was also an important determinant of its stiffness (Vuurmans and Gelok 1993). Old grass, having a higher vegetation density, would retain more water and have reduced sediment flow as compared to young grass (Barfield et al. 1979). Soil structure, and thus infiltration, tends to be better where there is permanent vegetation (Muscutt et al. 1993).

Models involving sediment removal by vegetative filter strips are widespread (Tollner et al. 1977; Barfield et al. 1979; Hayes et al. 1979; Flanagan et al. 1989). Munoz-Carpena (1993) developed a model to study hydrology and sediment movement in vegetative filter strips, and found that two of the most sensitive parameters were the soil moisture content and grass spacing. Sod-forming grasses prevent concentrated flow and sediment transport, but bunch-type grasses do not (Choi 1992). Pearce et al. (1998) showed that sediment movement was influenced by many factors, including percent of surface cover and roughness, vegetation height, density and biomass, percent shrubs, grasses, and sedges, soil texture of introduced sediment, and distance downslope. When riparian vegetation was clipped to the soil surface, there was a significant increase in sand (>200 um) movement downslope and, in a separate experiment, a smaller percentage of 2 to 10 um particles in sediment traps downslope because these particles stayed suspended. It is also possible that regular mowing of filter strips could decrease infiltration through increased compaction. The ANSWERS model simulations gave significantly greater runoff and soil loss from grazed versus ungrazed sites in a riparian zone, due to reduced infiltration (Noor 1990). Chaubey et al. (1994a) added runoff and infiltration components to the model of Overcash et al. (1981) to better assess vegetative filter strip performance.

Tim and Jolly (1994) were two of the first researchers to integrate geographic information systems (GIS) and a water quality model for evaluating nonpoint-source pollution in a watershed. Simulations for permanent vegetative filter strips along primary streams and/or grass contour buffer strips indicated that each alone reduced sediment load at the watershed outlet by more than 40%, but that both together gave a 71% reduction in load.

Schwer and Clausen (1989) reported some of the highest values for vegetative filter strip effectiveness, with 89% of the P and 92% of the N removed from dairy milk house wastewater.

The main mechanism of P removal by vegetative and riparian buffers is through surface flow. Cooper and Gilliam (1987) estimated a trapping rate of about 50% for P entering riparian areas. Cooke (1988) measured less P removal than N removal by a New Zealand riparian zone. Lowrance et al. (1984) found that riparian areas retain more calcium, magnesium, and N, than P. Vought et al. (1994) indicated that P removal from surface runoff is exponential, with 66% and 95% retention of soluble P in the first 8 and 16 m of buffer strip, respectively, while nitrate uptake appeared linear, with 20% and 50% retention. Daniels and Gilliam (1996) determined that 6 m grass and riparian filter strips, while reducing total P load by 50%, allowed 80% of the soluble P to pass through the filters. Where soluble P content is high, infiltration is critical to removal (Srivastava et al. 1996). Dillaha et al. (1987) found a close correlation between P and sediment removal (49% to 73% and 53% to 86%, respectively, on 4.6 m filters; and 65% to 93% and 70% to 98% on 9.1 m filters), because more than 90% of the total P was sediment-bound. Conversely, Magette et al. (1989) did not observe a close correlation between P and sediment removal (27% and 66%, respectively, on 4.6 m filters; and 46% and 82% on 9.2 m filters).

At two sites in North Carolina, relatively steep, forested riparian areas were much less effective in reducing total runoff than grass filters, but sediment filtration capacity was similar (Parsons et al. 1995). An evaluation of 25 storm events at the two sites indicated no inundation of the grass buffers, no runoff on the buffers' downslope edge with rain less than 1 inch (in), and approximately 80% reduction in runoff and sediment movement for 1 to 2 in storms with a 14 foot (ft) buffer. Although more than 50% of sediment-bound nutrients were filtered in the grass buffers, soluble P was not removed very effectively. A 28 ft buffer was even more (but not doubly) effective at reducing runoff, sediment yields, and sediment-bound nutrients, particularly with rain greater than 2 in, but on some storm events actually increased soluble P and mineral forms of N as compared to a 14 ft buffer.

Nitrate in shallow subsurface flow decreased from greater than 10 mg of N/L to less than 1 mg of N/L from entry to exit of a 50 m riparian zone in the North Carolina Coastal Plain, translating to only 5 of the 35 kg/ha/yr of N entering the zone leaving the watershed in stream flow (Jacobs and Gilliam 1985). In comparison, a riparian system in Maryland removed 45 kg/ha/yr (Peterjohn and Correll 1984).

Grass and riparian filter strips retained 20% to 50% of the ammonium-N and approximately 50% of the total N and nitrate-N passing through them (Daniels and Gilliam 1996).

Many of the findings already discussed in relation to sediment transport, and nutrient transport on sediment or in water, apply to pesticides as well, since many pesticides are dissolved or suspended in water and others are adsorbed to organic matter or clay in sediment. Grassed waterways have been shown to reduce loads of 2,4-D by 70% under both wet and dry conditions (Asmussen et al. 1977), and trifluralin by 86% and 96%, the lower number under wet conditions which reduced infiltration (Rhode et al. 1980). Arora et al. (1996, 2001) verified the impact that soil moisture may have on herbicide removal, reporting that 11%, 16%, and 8% of applied atrazine, metolachlor, and cyanazine was removed by smooth bromegrass filter strips when natural rainfall occurred on saturated soil, but that up to 100% of all three herbicides was removed under lower soil moisture contents.

Infiltration of runoff water into filter strips has been identified as a critical mechanism of removal of pesticides (Arora et al. 1996; Misra et al. 1996; Webster and Shaw 1996). Bharati (1997) measured five times as much water infiltration in a multi-species riparian buffer as in a grazed pasture and cultivated fields. Once in soil, there are numerous biological and chemical ways to inactivate pesticides. For example, plant residues in buffers have been shown to contain as much atrazine as the adjacent surface soil, even as high as 740 ppb (Fawcett et al. 1995).

Thirty ft wide filter strips of Coastal bermudagrass and wheat, planted 0, 140, and 290 ft from the base of the slope in a 435 ft wide watershed in Texas, reduced atrazine runoff losses in three events by 30% and 57%, respectively, as compared with similar watersheds without filter strips (Hoffman 1995). Oat buffer strips in corn reduced runoff losses of atrazine by 91% and 65% after applications of 2.2 and 4.5 kg/ha, respectively (Hall et al. 1983). Increased filter strip width decreased average pesticide concentrations in runoff (Barone et al. 1998), though this effect would be impacted by the time between pesticide application and rainfall.

In simulated rainfall studies in Iowa, 10:1 and 5:1 ratios of source area to smooth bromegrass filter strips (4.6 and 9.1 m) reduced atrazine runoff by

35% and 60%, respectively (Mickelson and Baker 1993). Misra et al. (1994), however, observed similar atrazine reductions of 26% to 48% and 31 to 50% with source to filter strip area ratios of 30:1 and 15:1, respectively, the ranges due to atrazine inflow concentrations of 0.1 and 1 mg/L. It should be noted that Misra and his colleagues used a constant filter strip size of 1.5 x 12.2 m and varied the source area to obtain the different ratios, whereas Mickelson and Baker varied the filter strip size and used a constant source area. With natural rainfall and smooth bromegrass filter strips, Arora et al. (1996, 2001) also found no differences in herbicide reductions between a 30:1 and 15:1 ratio. Arora and his colleagues varied neither the filter strip size (1.5 x 20 m) nor the source area (0.4 ha), but had one tank to collect all runoff and distribute the amounts required to simulate the two source area/buffer strip ratios.

Reductions in runoff loss with 2 or 4 m wide tall fescue filter strips were 55% to 74% and 50% to 76% for metolachlor and metribuzin, respectively (Webster and Shaw 1996). Five tall fescue buffer widths ranging from 0.5 to 4 m reduced runoff of metribuzin and metolachlor by at least 73% and 67%, respectively (Tingle et al. 1998).

Vegetative buffers can have great impact on the removal of sediment, nutrients, pesticides, and bacteria from surface runoff. However, the effectiveness of vegetative buffers is influenced by both controllable (vegetation density, height, and type; buffer width; slope length before reaching the buffer strips; proximity to the treated field; proximity to smaller streams; and ratio of runoff source area to buffer area) and uncontrollable factors (soil type, slope, rainfall intensity, size distribution of incoming sediment, and pesticide and nutrient properties) (NCASL 1992; Robinson et al. 1996).

Vegetative buffers, whether riparian or not, should be located with respect to the critical areas in watersheds. Impact of these buffers can be maximized by placing them where cultivated fields have close contact with higher order (larger flow volume) streams, if these exist within the watershed (Cooper et al. 1987).

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Attachment 10

THIS ATTACHMENT HAS BEEN REMOVED BECAUSE IT CONTAINS SYNGENTA DATA

Syngenta/Community Water System Ground Water Monitoring Study for Atrazine and its Major Degradation Products in Multiple States in the United States

Attachment 11
THIS ATTACHMENT HAS BEEN REMOVED BECAUSE IT CONTAINS SYNGENTA DATA
Atrazine: Chronic Dietary Exposure Assessment for Atrazine and the Simazine Metabolites Common to Atrazine

Attachment 12

Probabilistic Assessment of Drinking Water and Dietary Exposure Combined

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Executive Summary

An assessment of the combined dose from drinking water ingestion and the 99.9th percentile dietary exposure is presented. The dose is the total milligrams of chloro-triazines per kilogram of body weight per day.

The estimated distribution of the daily dose is determined for each of the 28 community water systems (CWSs) in the U.S.A. with some of the highest total chloro-triazine concentrations.

Within each CWS, the dose distribution is estimated for the general population served by each CWS as well as four subpopulations (Infants, Children 1 to 6, Children 7 to 12, and Adults 13 to 50). The probabilistic assessment evaluates four different exposure durations (acute, short-term, intermediate term, and chronic).

The estimated dose distributions describe the relative likelihood of different dose values in each CWS. Specifically, the estimated 1-th, 5-th, 10-th, 25-th, 50-th, 75-th, 90-th, 95-th, 99-th, and 99.9-th percentiles are reported.

The dose of total chloro-triazines from drinking water and dietary exposure is quite small (less than 0.5 to 1 μg/kg/day) even in the 28 CWSs with some of the highest total chloro-triazine concentrations.

In none of the 476 scenarios evaluated was the 99.9th percentile of the estimated dose distribution above the specified RfDs (includes a 1000x uncertainty factor) for acute, short-term, intermediate-term, and chronic exposure durations.

Based upon this analysis it is concluded that the total chloro-triazines residues of atrazine in diet and drinking water do not pose a risk to individuals drinking water from the CWSs with the highest total chloro-triazine concentrations.

1. Introduction

An assessment of the combined total chloro-triazine dose from drinking water ingestion and dietary exposure is presented. The dose is expressed as the total milligrams (mg) of chloro-triazines per kilogram (kg) of body weight per day (mg/kg-day). The estimated distribution of the daily dose is determined for each of 28 highly vulnerable community water systems (CWSs) discussed in EPA's Draft risk assessment of atrazine. Table 1 identifies these 28 CWSs.

In each of the 28 CWSs, the dose distribution is computed using five different measures of dose, namely,

1. Acute dose (daily dose) calculated from the daily total chloro-triazine concentrations,

2. Short-term dose (monthly average daily dose) calculated from the monthly average daily total chloro-triazine concentrations,

3. Intermediate-term dose (quarterly average daily dose) calculated from the quarterly average daily total chloro-triazine concentrations with the quarters defined as January to March, April to June, July to September, and October to December (i.e., Jan/Mar, Apr/Jun, Jul/Sep, and Oct/Dec),

4. Intermediate-term dose (quarterly average daily dose) calculated from the quarterly average daily total chloro-triazine concentrations with the quarters defined as February to April, May to July, August to October, and November to January (i.e., Feb/Apr, May/Jul, Aug/Oct, and Nov/Jan),

5. Chronic dose (chronic average daily dose) calculated from the chronic average daily total chloro-triazine concentration.

These estimated dose distributions describe the relative likelihood of different doses for individuals drinking water from each CWS. Specifically, the estimated 1-th, 5-th, 10-th, 25-th, 50-th, 75-th, 90-th, 95-th, 99-th, and 99.9-th percentiles are reported. The estimated percentage of the dose distribution below specified RfDs for acute, short-term, intermediate-term, and chronic exposure durations are also reported for infants, children ages 1-6, children ages 7-12, males and females ages 13 to 50, and the general population as follows:

Table	Dose	RfD (mg/kg-day)*				
		Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
7	Acute	Not Applicable	Not Applicable	Not Applicable	0.01	Not Applicable
8	Short Term	0.013	0.0063	0.0063	0.005	0.005
9	Intermediate Term	0.013	0.0063	0.0063	0.005	0.005
10	Intermediate Term	0.013	0.0063	0.0063	0.005	0.005
11	Chronic	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0.0018

* RfD = NOEL/Uncertainty Factor where UF = 1000

The details of the calculations performed to estimate the dose distribution for each population and subpopulation, each exposure duration, and each of the 28 CWSs are described in Appendix A.

Tables of the estimated dose distributions for each population and subpopulation, each exposure duration, and each of the 28 CWSs are provided in Appendix B.

2. Results

The estimated dose distributions in Appendix B describe the relative likelihood of different dose for individuals drinking water from each CWS. The estimated 1-th, 5-th, 10-th, 25-th, 50-th, 75-th, 90-th, 95-th, 99-th, and 99.9-th percentiles are reported in Appendix B for the 28 CWSs, the different populations and subpopulations, and the different exposure durations.
The estimated percentage of the dose distribution below specified RfDs for acute, short-term, intermediate-term, and chronic exposure durations are also reported.

In order to compare the estimated dose distributions for the 28 CWSs, two sets of summary tables have been prepared. In the first set of five summary tables (Tables 2 to 6), the estimated dose at the 99.9th percentile is given for each of the 28 CWSs for the acute, short-term, intermediate-term and chronic exposure and different subpopulations.

Table 2	Acute Dose	Daily Dose
Table 3	Short-Term Dose	Monthly Average Daily Dose
Table 4	Intermediate-Term Dose	Quarterly Average Daily Dose Quarters (Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)
Table 5	Intermediate-Term Dose	Quarterly Average Daily Dose Quarters (Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)
Table 6	Chronic Dose	Chronic Average Daily Dose

The results indicate that, for these 28 CWSs, exposure to total chloro-triazine in diet and water is low, even at the 99.9th percentile of the dose distribution (see Tables 2 to 6).

The data summarized in Tables 7 to 11 indicate that the distribution of daily doses were below the appropriate reference dose specified for each age group and duration of exposure, even at the 100th percentile in 465 out of 476 of the scenarios evaluated.

Table	Basis for Reference Dose	Number of Estimated Dose Distributions for 476 Scenarios Evaluated that Exceeded the RfD at the 100th Percentile*				
		Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
7	Acute	Not Applicable	Not Applicable	Not Applicable	0	Not Applicable
8	Short Term	1	1	1	0	4
9	Intermediate Term	0	0	0	0	2
10	Intermediate Term	0	0	0	0	2
11	Chronic	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0

* RfD = NOEL/Uncertainty Factor where UF = 1000

The distribution of daily doses were all below the reference dose at the 99.9th percentile for all exposure durations and age groups.

Table	Basis for Reference Dose	Number of Estimated Dose Distributions for 476 Scenarios Evaluated that Exceeded the RfD at the 100th Percentile*				
		Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
7	Acute	Not Applicable	Not Applicable	Not Applicable	0	Not Applicable
8	Short Term	0	0	0	0	0
9	Intermediate Term	0	0	0	0	0
10	Intermediate Term	0	0	0	0	0
11	Chronic	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0

* RfD = NOEL/Uncertainty Factor where UF = 1000

It should be noted that even in the CWS with the highest exposure (Salem, Illinois) and for the most sensitive subpopulations (infants, females ages 13-50), the distribution of doses were substantially below the RfD (Figures 1 to 5). In this analysis the vast majority of estimated doses were less than 1µg/kg body weight. For the lifetime exposure of the general population in this CWS, the doses were all less than 0.5 µg/kg/day.

<u>3. Conclusions</u>

This probabilistic assessment indicates that the dose of total chloro-triazines from drinking water and dietary exposure is quite small even in the 28 CWSs with some of the highest total chloro-triazine concentrations. Within each CWS, the estimated dose distribution is evaluated for the general population served by each CWS as well as four subpopulations (Infants, Children 1 to 6, Children 7 to 12, and Adults 13 to 50). The probabilistic assessment evaluates four different exposure durations (acute, short-term, intermediate term, and chronic).

The estimated dietary intake for females age 13 to 50 years is 3×10^{-6} mg/kg-day which is less than or equal to that for males (6×10^{-6} mg/kg-day for ages 13 to 19 and 3×10^{-6} mg/kg-day for ages 20 to 50). The estimated distribution of water intake (ml/kg-day) is the same for males and females. Hence, the chloro-triazine doses for males are greater than the doses for females, and the estimated dose distribution for the subpopulation Adults 13 to 50 is an upper bound on the estimated dose distribution for Females 13 to 50. Specifically, the percentage of doses for Females 13 to 50 below a value is greater than or equal to the percentage of doses for Adults 13 to 50 below that same value.

The percentage of the estimated dose distribution below specified RfDs for acute, short-term, intermediate-term, and chronic exposure durations summarized in Tables 7 to 11 indicate that 11 of the 476 scenarios analyzed exceeded the reference dose at the 100th percentile and none exceeded the RfD at the 99.9th percentile.

Among the 28 CWSs, even the smallest percentage of the estimated dose distribution below the specified RfD for the corresponding exposure duration is quite high for all exposure durations and populations and subpopulations.

Table	Dose	Smallest Percentage of the Estimated Dose Distribution Below the RfD among the 28 CWSs*				
		Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
7	Acute	Not Applicable	Not Applicable	Not Applicable	100%	Not Applicable
8	Short Term	99.95%	99.98%	99.99%	100%	99.96%
9	Intermediate Term	100%	100%	100%	100%	99.98%
10	Intermediate Term	100%	100%	100%	100%	99.99%
11	Chronic	Not Applicable	Not Applicable	Not Applicable	Not Applicable	100%

* RfD = NOEL/Uncertainty Factor where UF = 1000

Based upon this analysis it is concluded that the total chloro-triazines residues of atrazine in diet and drinking water do not pose a risk to individuals drinking water even in those CWSs reporting the highest atrazine exposure.

Table 1. Location of the 28 Community Water Systems (CWSs) in the U.S.A. with some of the highest total chloro-triazine concentrations.

CWS Index	Location				
	CWS #	CWS Name	City	County	State
1.	IA5903011	Chariton Municipal Water Works	Chariton	Lucas	IA
2.	IL0050300	Sorento Water Treatment Plant	Sorento	Bond	IL
3.	IL0250100	Flora Water Treatment Plant	Flora	Clay	IL
4.	IL0470200	W. Salem Water Treatment Plant	West Salem	Edwards	IL
5.	IL0510150	Farnia Water Treatment Plant	Farnia	Fayette	IL
6.	IL0610400	White Hall Water Treatment Plant	White Hall	Greene	IL
7.	IL1170150	Carlinville Water Works	Carlinville	Macoupin	IL
8.	IL1170400	Gillespie Water Treatment Plant	Gillespie	Macoupin	IL
9.	IL1170500	Hettick Water Supply	Hettick	Macoupin	IL
10.	IL1170950	Shipman Water Treatment Plant	Shipman	Macoupin	IL
11.	IL1175150	Palmyra-Modesto Water Commission	N Palmyra Twp	Macoupin	IL
12.	IL1175200	ADGPTV Water Commission	North Otter Twp	Macoupin	IL
13.	IL1210300	Kinmundy Water Treatment Plant	Kinmundy	Marion	IL
14.	IL1210450	Salem Water Treatment Plant	Salem	Marion	IL
15.	IL1214220	Centralia Water Treatment Plant	Centralia	Marion	IL
16.	IL1350300	Hillsboro Water Treatment Plant	Hillsboro	Montgomery	IL
17.	IL1910450	Wayne City Water Plant	Wayne City	Wayne	IL
18.	IL0250250	Louisville Water Treatment Plant	Louisville	Clay	IL
19.	IN5219006	Holland Water Department	Holland	Dubois	IL
20.	IN5240008	North Vernon Water Department	North Vernon	Jennings	IN
21.	IN5269001	Batesville Water Utility	Batesville	Ripley	IN
22.	IN5272001	Scottsburg Water Treatment Plant	Scottsburg	Scott	IN
23.	LA1047002	Iberville Water District #3	White Castle	Iberville	LA
24.	MO1010363	Higginsville Water Treatment Plant	Higginsville	Lafayette	MO
25.	MO2010112	Bucklin Water Department		Linn	MO
26.	M02010812	Vandalia Water Treatment Plant	Vandalia	Audrain	MO
27.	OH0801511	Sardinia Water Treatment Plant	Sardinia	Brown	OH
28.	OH4502314	Newark Water Works	Newark	Licking	OH

Table 2. Estimated total chloro-triazine daily doses (Acute) at the 99.9th percentile

CWS Index	**Acute Daily Dose (mg/kg-day) at the 99.9th Percentile for Adults Ages 13 – 50 Years**
1.	6.40E-04
2.	5.20E-04
3.	8.80E-04
4.	7.50E-04
5.	9.10E-04
6.	8.30E-04
7.	9.40E-04
8.	1.90E-03
9.	2.00E-03
10.	1.80E-03
11.	1.10E-03
12.	9.60E-04
13.	7.50E-04
14.	3.00E-03
15.	1.20E-03
16.	1.10E-03
17.	1.40E-03
18.	1.00E-03
19.	8.70E-04
20.	1.10E-03
21.	8.00E-04
22.	8.90E-04
23.	1.40E-03
24.	1.00E-03
25.	7.30E-04
26.	1.20E-03
27.	2.20E-03
28.	9.20E-04

Table 3. Estimated monthly average (Short-Term) total chloro-triazine daily doses at the 99.9th percentile

CWS Index	Monthly Average Daily Dose (mg/kg-day) at the 99.9th Percentile				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1.	2.40E-03	1.00E-03	8.60E-04	5.70E-04	6.90E-04
2.	2.20E-03	9.00E-04	8.20E-04	5.20E-04	6.80E-04
3.	3.20E-03	1.20E-03	1.10E-03	6.90E-04	1.10E-03
4.	3.30E-03	1.20E-03	1.00E-03	7.70E-04	1.10E-03
5.	3.10E-03	1.30E-03	1.20E-03	7.80E-04	1.00E-03
6.	3.50E-03	1.50E-03	1.20E-03	8.00E-04	1.30E-03
7.	2.80E-03	1.20E-03	1.10E-03	6.60E-04	9.70E-04
8.	8.20E-03	3.00E-03	2.40E-03	1.70E-03	2.20E-03
9.	7.20E-03	2.50E-03	2.40E-03	1.80E-03	2.50E-03
10.	7.10E-03	2.90E-03	2.70E-03	1.80E-03	2.40E-03
11.	4.30E-03	1.80E-03	1.50E-03	1.10E-03	1.40E-03
12.	3.50E-03	1.30E-03	1.00E-03	7.60E-04	1.10E-03
13.	2.70E-03	1.00E-03	9.00E-04	7.20E-04	9.20E-04
14.	1.20E-02	4.50E-03	4.20E-03	2.70E-03	3.40E-03
15.	4.80E-03	2.10E-03	1.80E-03	1.10E-03	1.60E-03
16.	5.60E-03	1.60E-03	1.50E-03	1.10E-03	1.40E-03
17.	4.20E-03	1.60E-03	1.10E-03	1.10E-03	1.10E-03
18.	3.90E-03	1.70E-03	1.60E-03	9.10E-04	1.30E-03
19.	3.70E-03	1.60E-03	1.30E-03	8.30E-04	1.10E-03
20.	3.70E-03	1.60E-03	1.30E-03	8.10E-04	1.00E-03
21.	3.20E-03	1.30E-03	1.10E-03	7.70E-04	9.00E-04
22.	4.00E-03	1.60E-03	1.40E-03	8.70E-04	1.50E-03
23.	4.20E-03	1.80E-03	1.40E-03	9.80E-04	1.40E-03
24.	4.30E-03	1.80E-03	1.60E-03	1.00E-03	1.60E-03
25.	2.70E-03	1.10E-03	1.10E-03	7.30E-04	9.70E-04
26.	4.80E-03	1.70E-03	1.50E-03	1.00E-03	1.50E-03
27.	9.30E-03	3.80E-03	3.00E-03	2.10E-03	2.60E-03
28.	2.10E-03	7.40E-04	6.20E-04	4.40E-04	6.20E-04

Table 4. Estimated quarterly average (Intermediate-Term) total chloro-triazine daily doses at the 99.9th percentile

CWS Index	Quarterly Average Daily Dose (mg/kg-day) at the 99.9th Percentile Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1.	2.10E-03	8.20E-04	6.60E-04	4.60E-04	5.00E-04
2.	1.80E-03	8.20E-04	7.00E-04	4.40E-04	7.20E-04
3.	2.10E-03	8.80E-04	8.50E-04	5.40E-04	8.10E-04
4.	2.60E-03	1.20E-03	9.00E-04	6.20E-04	8.20E-04
5.	2.80E-03	1.00E-03	9.60E-04	6.80E-04	8.90E-04
6.	3.30E-03	1.50E-03	1.20E-03	7.70E-04	1.30E-03
7.	2.10E-03	9.20E-04	7.80E-04	5.10E-04	7.90E-04
8.	5.80E-03	2.10E-03	1.80E-03	1.40E-03	1.60E-03
9.	5.10E-03	2.10E-03	1.80E-03	1.20E-03	1.80E-03
10.	6.90E-03	2.90E-03	2.80E-03	1.50E-03	2.80E-03
11.	4.10E-03	1.70E-03	1.60E-03	9.70E-04	1.50E-03
12.	2.30E-03	9.60E-04	8.70E-04	5.40E-04	9.90E-04
13.	2.30E-03	9.40E-04	8.50E-04	5.30E-04	8.50E-04
14.	7.10E-03	2.80E-03	2.30E-03	1.70E-03	2.20E-03
15.	3.10E-03	1.40E-03	1.20E-03	7.50E-04	1.10E-03
16.	3.10E-03	1.10E-03	1.00E-03	7.70E-04	9.00E-04
17.	2.20E-03	9.20E-04	8.10E-04	5.20E-04	8.10E-04
18.	3.00E-03	1.30E-03	1.20E-03	7.10E-04	1.00E-03
19.	3.60E-03	1.50E-03	1.20E-03	8.30E-04	1.00E-03
20.	2.10E-03	8.70E-04	8.10E-04	5.30E-04	7.30E-04
21.	3.30E-03	1.20E-03	1.00E-03	7.80E-04	9.00E-04
22.	3.90E-03	1.60E-03	1.30E-03	8.70E-04	1.10E-03
23.	2.00E-03	8.80E-04	8.10E-04	4.90E-04	8.60E-04
24.	3.20E-03	1.30E-03	1.20E-03	7.80E-04	1.20E-03
25.	2.90E-03	1.20E-03	1.00E-03	7.30E-04	8.90E-04
26.	2.80E-03	1.20E-03	9.70E-04	6.40E-04	1.10E-03
27.	6.30E-03	2.60E-03	2.40E-03	1.40E-03	1.90E-03
28.	1.30E-03	5.80E-04	5.60E-04	3.30E-04	4.90E-04

Table 5. Estimated quarterly average (Intermediate-Term) total chloro-triazine daily doses at the 99.9th percentile

CWS Index	Quarterly Average Daily Dose (mg/kg-day) at the 99.9th Percentile Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1.	2.00E-03	8.60E-04	7.40E-04	5.00E-04	6.00E-04
2.	1.80E-03	7.90E-04	7.30E-04	4.40E-04	6.60E-04
3.	2.10E-03	8.90E-04	8.00E-04	5.50E-04	7.60E-04
4.	2.20E-03	9.70E-04	8.70E-04	5.20E-04	8.40E-04
5.	2.50E-03	9.60E-04	8.90E-04	6.00E-04	9.50E-04
6.	3.30E-03	1.40E-03	1.20E-03	7.60E-04	1.30E-03
7.	2.30E-03	1.00E-03	9.10E-04	5.60E-04	8.60E-04
8.	6.00E-03	2.50E-03	2.00E-03	1.40E-03	1.60E-03
9.	6.20E-03	2.30E-03	2.10E-03	1.50E-03	2.00E-03
10.	6.80E-03	2.90E-03	2.70E-03	1.80E-03	2.30E-03
11.	4.30E-03	1.80E-03	1.60E-03	9.60E-04	1.50E-03
12.	2.60E-03	1.10E-03	9.40E-04	6.50E-04	1.00E-03
13.	2.50E-03	9.30E-04	8.30E-04	6.00E-04	8.10E-04
14.	7.20E-03	3.10E-03	2.70E-03	1.70E-03	2.40E-03
15.	2.90E-03	1.30E-03	1.20E-03	7.00E-04	1.20E-03
16.	3.00E-03	1.30E-03	1.10E-03	7.20E-04	9.90E-04
17.	2.60E-03	9.70E-04	8.70E-04	6.20E-04	7.50E-04
18.	3.20E-03	1.30E-03	1.20E-03	7.50E-04	1.00E-03
19.	2.90E-03	1.30E-03	1.20E-03	7.40E-04	9.50E-04
20.	2.70E-03	1.00E-03	8.50E-04	6.80E-04	8.20E-04
21.	2.90E-03	1.20E-03	9.80E-04	7.40E-04	8.20E-04
22.	3.10E-03	1.30E-03	1.20E-03	7.30E-04	1.10E-03
23.	2.80E-03	1.20E-03	1.10E-03	6.30E-04	9.70E-04
24.	4.30E-03	1.60E-03	1.40E-03	9.40E-04	1.20E-03
25.	2.70E-03	1.10E-03	1.10E-03	5.80E-04	1.10E-03
26.	2.70E-03	1.10E-03	1.00E-03	6.90E-04	1.10E-03
27.	7.50E-03	3.00E-03	2.80E-03	1.80E-03	2.30E-03
28.	1.20E-03	5.10E-04	4.80E-04	3.20E-04	5.30E-04

Table 6. Estimated lifetime average (Chronic) total chloro-triazine daily doses at the 99.9th percentile

CWS Index	**Chronic Average Daily Dose (mg/kg-day) at the 99.9th Percentile for the General Population**
1.	1.70E-04
2.	1.90E-04
3.	1.80E-04
4.	2.80E-04
5.	3.20E-04
6.	2.30E-04
7.	2.80E-04
8.	2.70E-04
9.	5.70E-04
10.	4.50E-04
11.	3.70E-04
12.	3.40E-04
13.	1.60E-04
14.	3.40E-04
15.	2.90E-04
16.	2.60E-04
17.	1.90E-04
18.	2.50E-04
19.	1.80E-04
20.	1.50E-04
21.	2.40E-04
22.	1.80E-04
23.	2.20E-04
24.	2.40E-04
25.	1.30E-04
26.	2.80E-04
27.	1.90E-04
28.	1.00E-04

Table 7. Percentage of the estimated distribution of the ACUTE DOSE below the acute RfD

CWS Index	**Percentage Below Acute RfD for Adults Ages 13 – 50 Years**
1.	100%
2.	100%
3.	100%
4.	100%
5.	100%
6.	100%
7.	100%
8.	100%
9.	100%
10.	100%
11.	100%
12.	100%
13.	100%
14.	100%
15.	100%
16.	100%
17.	100%
18.	100%
19.	100%
20.	100%
21.	100%
22.	100%
23.	100%
24.	100%
25.	100%
26.	100%
27.	100%
28.	100%

Table 8. Percentage of the estimated distribution of the SHORT-TERM DOSE below the short-term RfD

CWS Index	Percentage Below Short-Term RfD				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1.	100%	100%	100%	100%	100%
2.	100%	100%	100%	100%	100%
3.	100%	100%	100%	100%	100%
4.	100%	100%	100%	100%	100%
5.	100%	100%	100%	100%	100%
6.	100%	100%	100%	100%	100%
7.	100%	100%	100%	100%	100%
8.	100%	100%	100%	100%	100%
9.	100%	100%	100%	100%	100%
10.	100%	100%	100%	100%	99.99%
11.	100%	100%	100%	100%	100%
12.	100%	100%	100%	100%	100%
13.	100%	100%	100%	100%	100%
14.	99.95%	99.98%	99.99%	100%	99.96%
15.	100%	100%	100%	100%	100%
16.	100%	100%	100%	100%	99.99%
17.	100%	100%	100%	100%	100%
18.	100%	100%	100%	100%	100%
19.	100%	100%	100%	100%	100%
20.	100%	100%	100%	100%	100%
21.	100%	100%	100%	100%	100%
22.	100%	100%	100%	100%	100%
23.	100%	100%	100%	100%	100%
24.	100%	100%	100%	100%	100%
25.	100%	100%	100%	100%	100%
26.	100%	100%	100%	100%	100%
27.	100%	100%	100%	100%	99.98%
28.	100%	100%	100%	100%	100%

Table 9. Percentage of the estimated distribution of the INTERMEDIATE-TERM DOSE below the intermediate-term RfD

CWS Index	**Percentage Below Intermediate-Term RfD Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec**				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1.	100%	100%	100%	100%	100%
2.	100%	100%	100%	100%	100%
3.	100%	100%	100%	100%	100%
4.	100%	100%	100%	100%	100%
5.	100%	100%	100%	100%	100%
6.	100%	100%	100%	100%	100%
7.	100%	100%	100%	100%	100%
8.	100%	100%	100%	100%	100%
9.	100%	100%	100%	100%	100%
10.	100%	100%	100%	100%	99.98%
11.	100%	100%	100%	100%	100%
12.	100%	100%	100%	100%	100%
13.	100%	100%	100%	100%	100%
14.	100%	100%	100%	100%	99.99%
15.	100%	100%	100%	100%	100%
16.	100%	100%	100%	100%	100%
17.	100%	100%	100%	100%	100%
18.	100%	100%	100%	100%	100%
19.	100%	100%	100%	100%	100%
20.	100%	100%	100%	100%	100%
21.	100%	100%	100%	100%	100%
22.	100%	100%	100%	100%	100%
23.	100%	100%	100%	100%	100%
24.	100%	100%	100%	100%	100%
25.	100%	100%	100%	100%	100%
26.	100%	100%	100%	100%	100%
27.	100%	100%	100%	100%	100%
28.	100%	100%	100%	100%	100%

Table 10. Percentage of the estimated distribution of the INTERMEDIATE-TERM DOSE below the intermediate-term RfD

CWS Index	**Percentage Below Intermediate-Term RfD Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan**				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1.	100%	100%	100%	100%	100%
2.	100%	100%	100%	100%	100%
3.	100%	100%	100%	100%	100%
4.	100%	100%	100%	100%	100%
5.	100%	100%	100%	100%	100%
6.	100%	100%	100%	100%	100%
7.	100%	100%	100%	100%	100%
8.	100%	100%	100%	100%	100%
9.	100%	100%	100%	100%	100%
10.	100%	100%	100%	100%	99.99%
11.	100%	100%	100%	100%	100%
12.	100%	100%	100%	100%	100%
13.	100%	100%	100%	100%	100%
14.	100%	100%	100%	100%	99.99%
15.	100%	100%	100%	100%	100%
16.	100%	100%	100%	100%	100%
17.	100%	100%	100%	100%	100%
18.	100%	100%	100%	100%	100%
19.	100%	100%	100%	100%	100%
20.	100%	100%	100%	100%	100%
21.	100%	100%	100%	100%	100%
22.	100%	100%	100%	100%	100%
23.	100%	100%	100%	100%	100%
24.	100%	100%	100%	100%	100%
25.	100%	100%	100%	100%	100%
26.	100%	100%	100%	100%	100%
27.	100%	100%	100%	100%	100%
28.	100%	100%	100%	100%	100%

Table 11. Percentage of the estimated distribution of the CHRONIC DOSE below the chronic RfD

CWS Index	**Percentage Below Chronic RfD (0.0018 mg/kg-day) for the General Population**
1.	100%
2.	100%
3.	100%
4.	100%
5.	100%
6.	100%
7.	100%
8.	100%
9.	100%
10.	100%
11.	100%
12.	100%
13.	100%
14.	100%
15.	100%
16.	100%
17.	100%
18.	100%
19.	100%
20.	100%
21.	100%
22.	100%
23.	100%
24.	100%
25.	100%
26.	100%
27.	100%
28.	100%

Figure 1. Estimated total chloro-triazine acute dose distribution for the CWS with the highest exposure (Salem, Illinois)

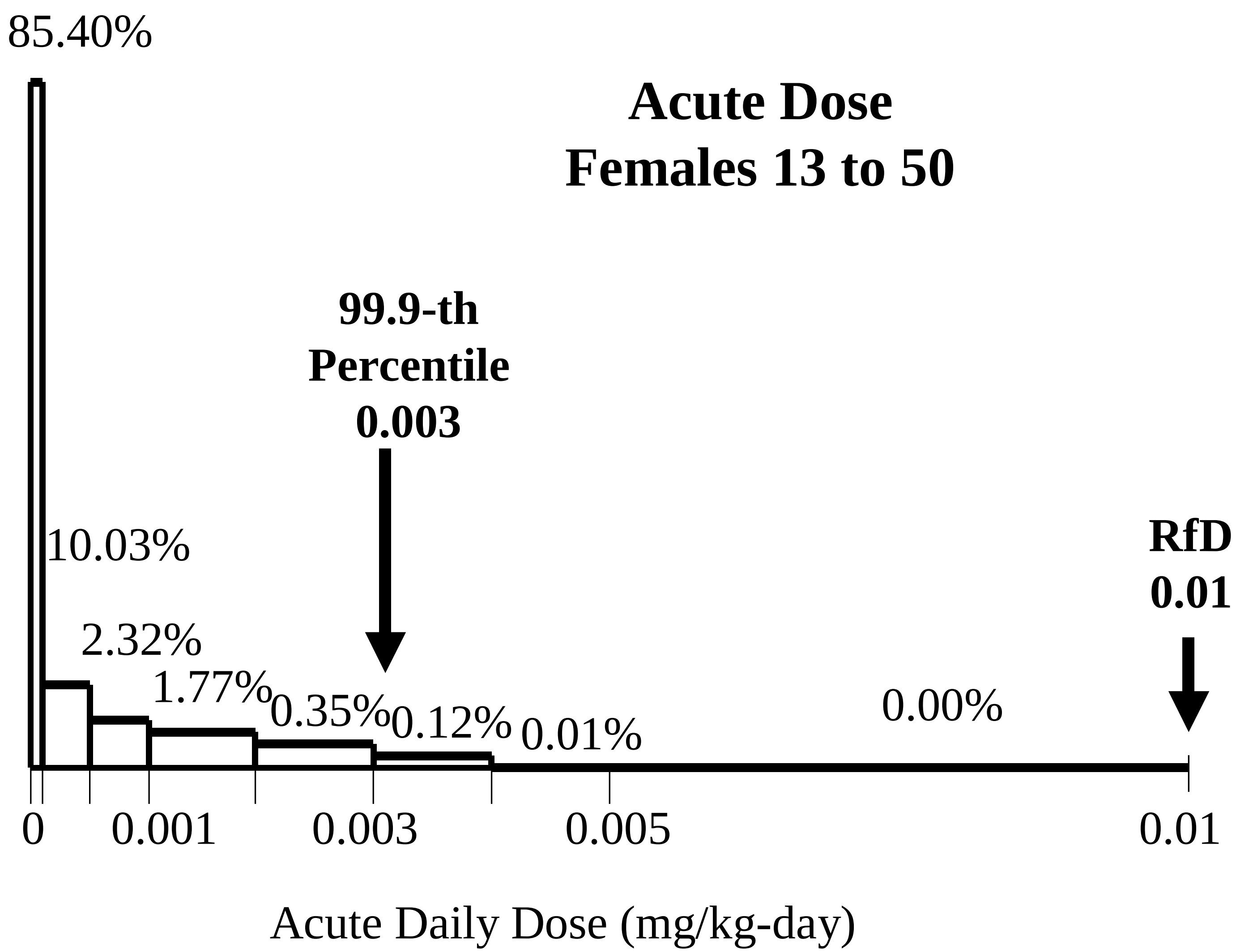


Figure 2. Estimated total chloro-triazine short-term dose distribution for the CWS with the highest exposure (Salem, Illinois)

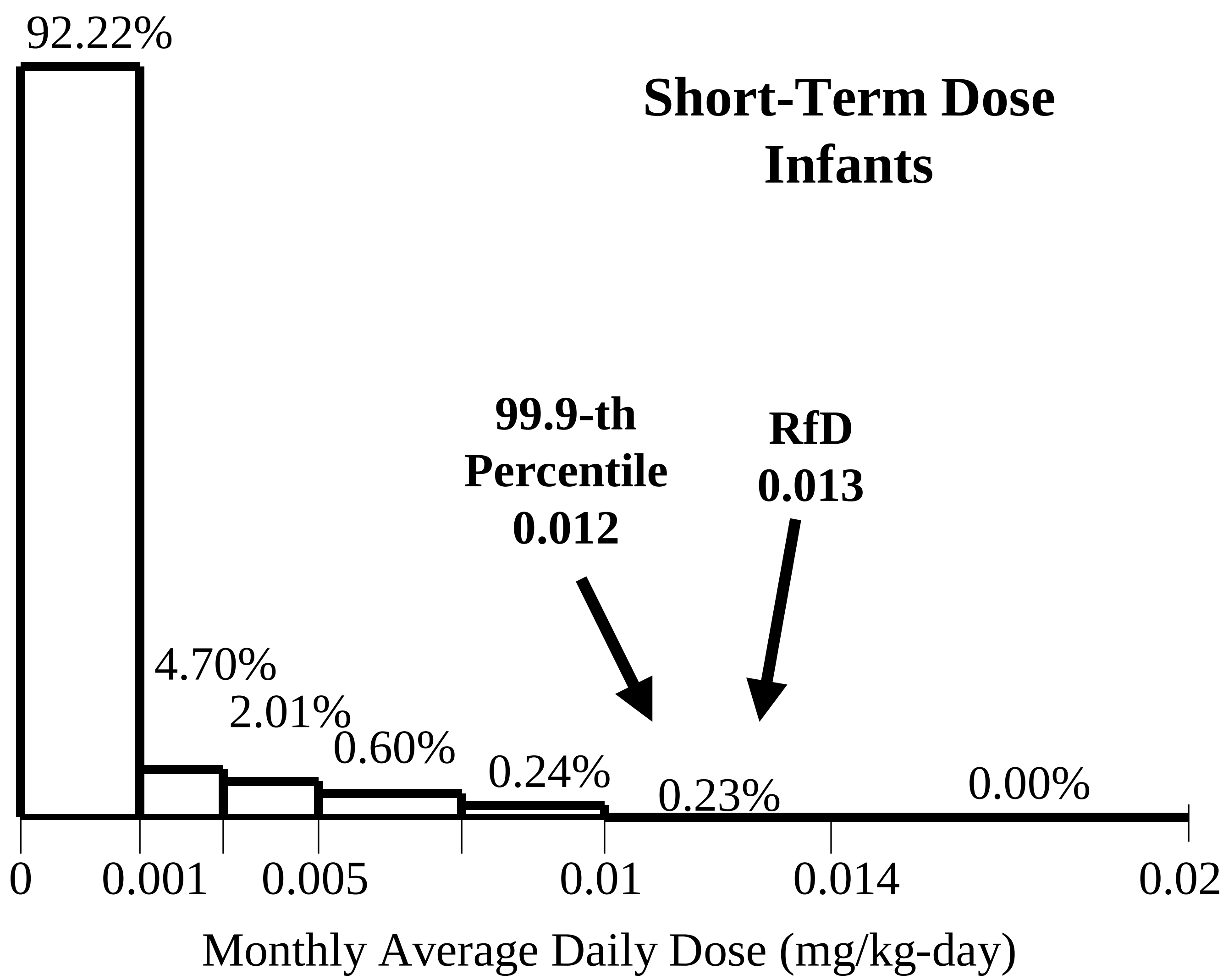


Figure 3. Estimated total chloro-triazine intermediate-term dose distribution for the CWS with the highest exposure (Salem, Illinois): (Quarters: January to March, April to June, July to September, October to December)

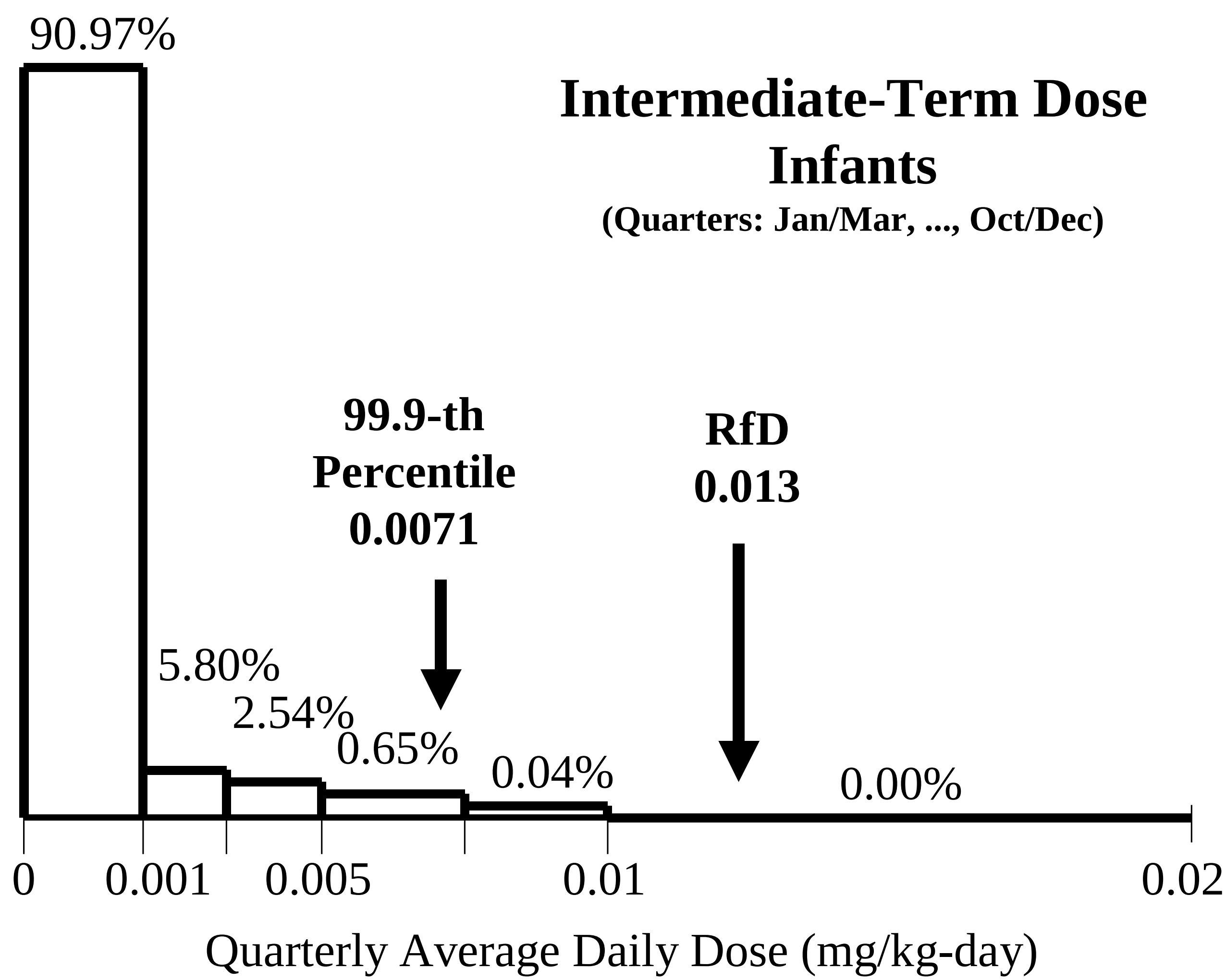


Figure 4. Estimated total chloro-triazine intermediate-term dose distribution for the CWS with the highest exposure (Salem, Illinois): (Quarters: February to April, May to July, August to October, November to January)

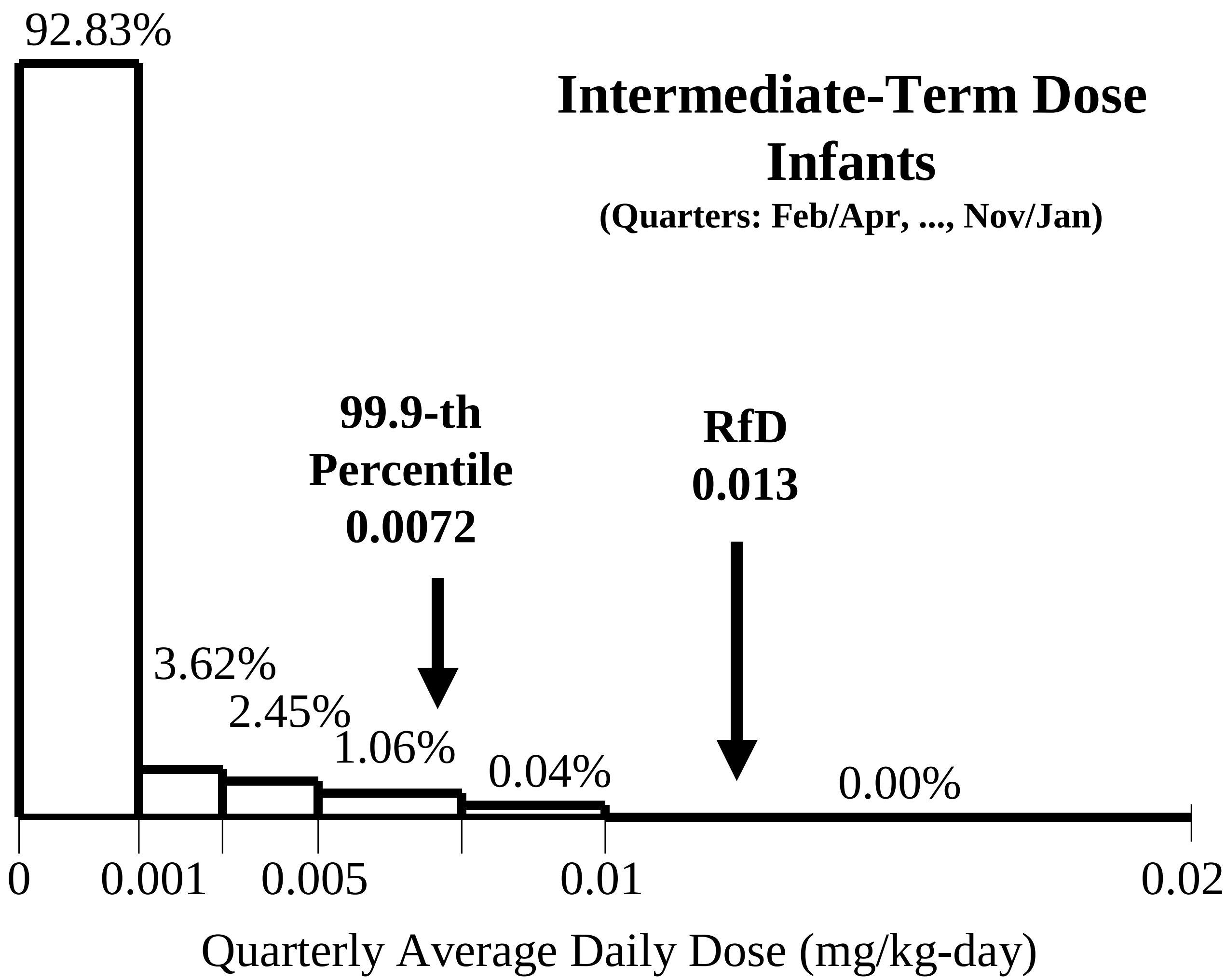
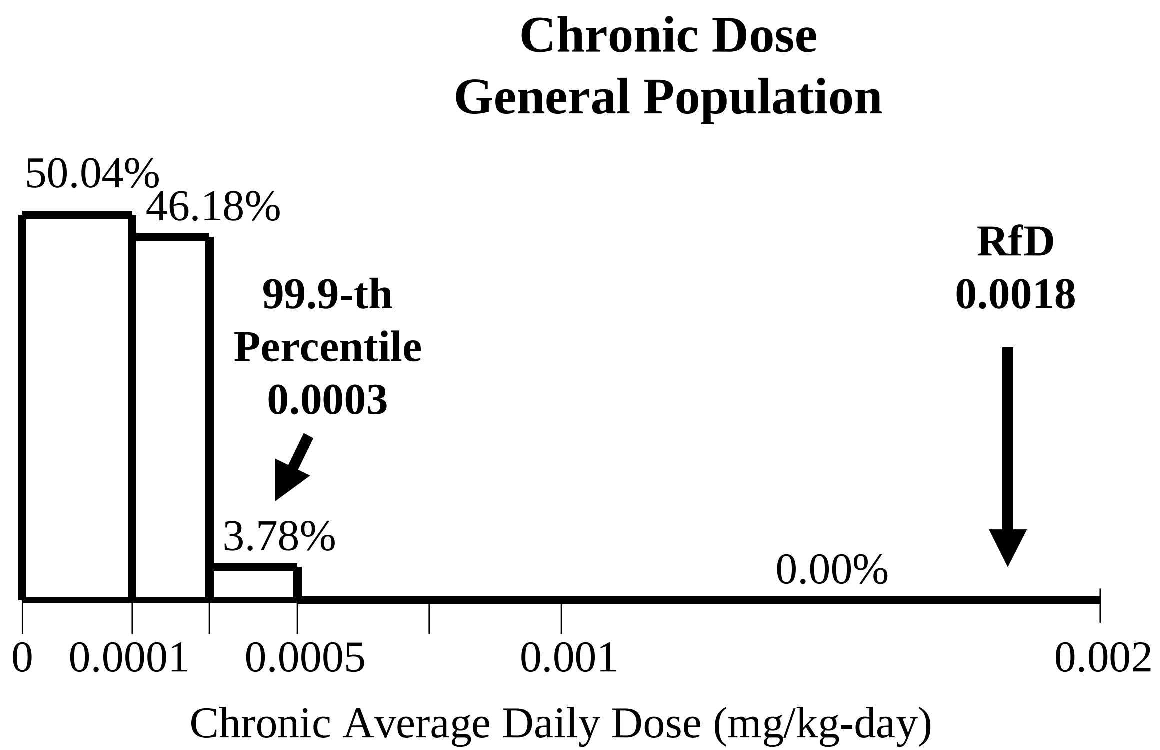


Figure 5. Estimated total chloro-triazine chronic dose (70 year lifetime average daily dose) distribution for the CWS with the highest exposure (Salem, Illinois)



Appendix A

Details of the Calculations

Performed to Estimate the Dose Distribution

for Each of the 28 CWSs,

Each Population and Subpopulation,

and Each Exposure Duration

The details of the calculations performed to estimate the dose distribution for each of the 28 CWSs, each exposure duration, and each population and subpopulation are described in this Appendix.

A.1 Triazine Concentration Data

Daily Concentrations

The total chloro-triazine concentration in the drinking water is based on the integrated triazine surface water data from 3 sources (PLEX, VMP, and ARP) combined. The total chloro-triazine concentration is calculated using EPA's regression equations.

The total chloro-triazine concentrations for individual days are determined as follows:

1. The calculated total chloro-triazine concentrations from the 3 sources are pooled into a single dataset.

2. If there is more than one observation on the same day, then that day's total chloro-triazine concentration is defined to be the average of the observations on that day.

3. The total chloro-triazine concentration for all days in the month of the first observation before the day of the first observation are defined to be equal to the total chloro-triazine concentration on the first observation day.

4. The total chloro-triazine concentration for all days in the month of the last observation after the last observation are defined to be equal to the total chloro-triazine concentration on the last observation day.

5. For the first half of the days between two observations, the total chloro-triazine concentration is defined to be equal to the concentration for the

first observation day; for the second half of the days between two observations, the total chloro-triazine concentration is defined to be equal to the concentration for the second observation day.

For example, for the Salem Water Treatment Plant in Salem, Illinois (CWS Index 14 in Table 1), the first two observations and the last two observations are

1/19/1993: 0.58 ppb
4/13/1993: 0.51 ppb

10/30/2000: 0.325 ppb
11/13/2000: 0.245 ppb.

Using (3), from 1/1/93 to 1/18/93 the concentration is 0.58 ppb. Using (4), from 11/14/00 to 11/31/00 the concentration is 0.245 ppb. Using (5), from 1/20/93 to 3/2/93 the concentration is 0.58 ppb. (There are 84 days from 1/19/93 to 4/13/93; half of 84 is 42; 42 days from 1/19/93 is 3/2/93.) Using (5), from 11/1/00 to 11/6/00 the concentration is 0.325 ppb. (There are 14 days from 10/30/00 to 11/13/00; half of 14 is 7; 7 days from 10/30/00 is 11/6/00.)

The total chloro-triazine concentration profile over days is a step function corresponding to the integrated triazine surface water data from 3 sources (PLEX, VMP, and ARP) combined.

Only days from the month of the first observation to the month of the last observation are used to determine the probability distribution of the daily concentration.

Monthly Concentrations

The monthly averages of the daily total chloro-triazine concentrations are determined. The days per month are the days in a 365-day year; that is, 31 days in January, 28 days in February, etc.

Only the months from the month of the first observation to the month of the last observation are used to determine the probability distribution of the monthly average daily concentration.

Quarterly Concentrations

The quarterly average of the daily total chloro-triazine concentrations are determined.

The first definition for quarters is January to March, April to June, July to September, and October to December (i.e., Jan/Mar, Apr/Jun, Jul/Sep, and Oct/Dec). The quarterly average concentration is the average of the daily total chloro-triazine concentrations in the quarter. (That is, 90 days in Jan/Mar, 91 days in Apr/Jun, 92 days in Jul/Sep, and 92 days in Oct/Dec.)

The second definition for quarters is February to April, May to July, August to October, and November to January (i.e., Feb/Apr, May/Jul, Aug/Oct, and Nov/Jan). The quarterly average concentration is the average of the daily total chloro-triazine concentrations in the quarter. (That is, 89 days in Feb/Apr, 92 days in May/Jul, 92 days in Aug/Oct, and 92 days in Nov/Jan.)

The second definition of quarters is considered to evaluate the potential effect of the second quarterly average concentration being potentially higher for May/Jul than Apr/Jun.

Daily concentrations for days in the first quarter before the first observation day are set equal to the concentration on the first observation day. Daily concentrations for days in the last quarter after the last observation day are set equal to the concentration on the last observation day.

Only the quarters from the quarter of the first observation to the quarter of the last observation are used to determine the probability distribution of the quarterly average daily concentration.

A.2 Calculation of Dose

The daily dose of total chloro-triazines is calculated using the following equation:

Dose = DietDose + WaterIngested x CWS Conc. x Conversion Factor.

This equation combines the dietary dose (DietDose) with the dose from drinking water ingestion. The dose from drinking water ingestion is

WaterIngested x CWS Conc. x Conversion Factor.

The dose from drinking water ingestion is the volume of water ingested (WaterIngested) times the CWSs total chloro-triazine concentration (CWS Conc.) times the factor converting the product to mg/kg-day (Conversion Factor).

Input

The dietary doses are the following age-specific results from EPA's chronic assessment for atrazine and its chlorinated metabolites:

DietDose = 8×10^{-6}	mg/kg-day	for Infants
DietDose = 1.7×10^{-5}	mg/kg-day	for Children 1 to 6
DietDose = 9.0×10^{-6}	mg/kg-day	for Children 7 to 12
DietDose = 3×10^{-6}	mg/kg-day	for Females 13 to 50
DietDose = 6×10^{-6}	mg/kg-day	for Males 13 to 19
DietDose = 3×10^{-6}	mg/kg-day	for Males 19 to 50
DietDose = 3×10^{-6}	mg/kg-day	for Seniors

WaterIngested is in units of ml/kg-day. CWS Conc. is in units of ppb (µg/kg). Thus, the Conversion Factor is

0.001 (liters/ml) x 0.001 (mg/µg) = 0.000001.

The WaterIngested is randomly generated from the following EPA distributions for drinking water ingestion (total tapwater intake):

Age	Percentiles of Water Intake (ml/kg-day)								
	1%	5%	10%	25%	50%	75%	90%	95%	99%
<1	0	0	0	16	57	101	156	170	218
1-10	0	4	6	12	21	33	49	64	98
11-19	0	2	4	7	13	20	30	39	64
20-44	1.6	4.9	7.1	11.2	16.8	23.7	32.2	38.4	53.4
45-64	4.4	8.0	10.3	14.7	20.2	27.2	35.5	42.1	57.8
65-74	4.6	8.7	10.9	15.1	20.2	27.2	35.2	40.6	51.6
75+	3.8	8.8	10.7	15.0	20.5	27.1	33.9	38.6	47.2

Sources:

For <1, 1-10, and 11-19: Table 4-2. Estimate of Total Direct and Indirect Water Ingestion, All Sources by Broad Age Category for U.S. Children (EPA 2000).

For 20-44, 45-64, 65-74, and 75+: Table 3-7 Total Tapwater Intake (ml/kg-day) for Both Sexes Combined. Exposure Factors Handbook (EPA, August 1997).

Distribution of Age and Gender in the County Supplied by the CWS

For each of the 28 CWSs, the county supplied by the CWS is identified. The 1990 U.S. Census data on age and gender in this county are identified.

For example, the Salem Water Treatment Plant (CWS Index 14 in Table 1) supplies Marion County, Illinois. The FIPS code for Marion County, Illinois, is 17121.

The Census data for this county imply that there are 19,784 males and 21,829 females in this county (i.e., approximately 47.54% male and 52.46% female).

The Census data for this county also imply the following information:

Age Group	Percentage of County Population	
	Males	Females
<1	0.00774	0.01502
<2	0.02156	0.02821
<3	0.03557	0.04210
etc.	etc.	etc.

Monte Carlo Calculation for Non-Chronic Exposures

A separate Monte Carlo analysis is done for each of the following exposure durations:

Acute	Day,
Short-Term	Month,
Intermediate	Quarter (Quarters: Jan/Mar, etc.),
Intermediate	Quarter (Quarters: Feb/Apr, etc.), and
Chronic	70 years.

Each Monte Carlo analysis includes 10,000 Monte Carlo simulations.

The non-chronic (acute, short-term, and intermediate-term) exposure durations are analyzed slightly differently than the chronic exposure durations.

For the non-chronic exposure durations, each of the following populations and subpopulations is evaluated separately:

Infants,
Children 1 to 6,
Children 7 to 12,
Adults 13 to 50, and
General Population.

For each subpopulation (Infants, Children 1 to 6, Children 7 to 12, and Adults) and each population (General Population, all ages), each of the 10,000 Monte Carlo simulations is performed as follows:

1. Using the Census implied distribution of age and gender in the county supplied by the CWS, randomly select an individual in the specified subpopulation of this county.

2. Determine the age- and gender-specific dietary dose (DietDose). These are the age- and gender-specific constants described above.

3. Randomly select a WaterIngested value from the age-specific distributions of total tapwater intake.

4. Randomly select a CWS Conc. value from the CWS-specific distribution of total chloro-triazine concentrations corresponding to the specified exposure duration:

Specified Exposure Duration	Distribution of Total Chlorotriazine Concentrations
Acute	Daily Conc.
Short-Term	Monthly Avg. Conc.
Intermediate-Term	Quarterly Avg. Conc. Quarters (Jan/Mar, ...)
Intermediate-Term	Quarterly Avg. Conc. Quarters (Feb/Apr, ...)

5. Calculate the estimated dose from dietary exposure and drinking water ingestion for this randomly selected individual to be

Dose =
DietDose + WaterIngested x CWS Conc. x Conversion Factor.

Repeating this procedure 10,000 times for each CWS, each population and subpopulation, and the four non-chronic exposure durations results in the estimated dose distributions.

Monte Carlo Calculation for Chronic Exposures

For the chronic exposure duration, 70 years of exposure are simulated for each individual. For each CWS, the total chloro-triazine concentration is the average daily concentration for that CWS. For each CWS, the population simulated is the population of all people served by the CWS. The proportion of males and females in the simulated population are the county-specific proportions.

For each CWS, each of the 10,000 Monte Carlo simulations is performed as follows:

1. Calculate the average of daily water concentrations from the first day of the month containing the first observation in the integrated triazine surface water data from 3 sources (PLEX, VMP, and ARP) combined to the last day of the month containing the last observation. This average is the Chronic CWS concentration. This value is the same for each simulation for a CWS.

2. Randomly determine the gender of the individual being simulated from the county-specific gender proportions.

3. Randomly select a percentage (0 to 100%) to use to determine the individual's age-specific water intakes. For example, if percentage is 20%, then the individual's water intake at each age is the 20-th percentile of the WaterIntake distribution for that age.

4. Sum the age- and gender-specific dietary dose and the age-specific drinking water ingestion dose over all ages from 0 to 70. That is, sum

   DietDose +
   WaterIntake x Chronic CWS Concentration x Conversion Factor over all ages from 0 through 69 (that is, from birth to the 70-th birthday, 70 years). The sum is the sum of 70 yearly values.

5. The simulated Chronic Average Daily Dose (mg/kg-day) is the sum divided by 70.

Repeating this procedure 10,000 times for each CWS results in the estimated dose distributions for chronic exposure.

Appendix B

Tables of the Estimated Distributions of Dose

from Drinking Water Ingestion and Dietary Exposure

for Each of 28 Community Water Systems in the U.S.A.

with Some of the Highest Total chloro-triazine Concentrations

Table 1.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Chariton Municipal Water Works, Chariton, Lucas County, Iowa					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				4.10E-06	
5%				7.30E-06	
10%				1.00E-05	
25%				1.70E-05	
50%				3.10E-05	
75%				5.50E-05	
90%				9.80E-05	
95%				1.50E-04	
99%				3.40E-04	
99.9%				6.40E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 1.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Chariton Municipal Water Works, Chariton, Lucas County, Iowa					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.50E-05	7.40E-06	5.10E-06	6.00E-06
5%	8.00E-06	2.00E-05	1.10E-05	8.60E-06	1.00E-05
10%	8.00E-06	2.40E-05	1.40E-05	1.20E-05	1.30E-05
25%	3.60E-05	3.30E-05	2.20E-05	1.90E-05	2.20E-05
50%	9.80E-05	5.30E-05	3.70E-05	3.30E-05	3.60E-05
75%	2.10E-04	8.70E-05	6.50E-05	5.50E-05	6.20E-05
90%	3.80E-04	1.50E-04	1.20E-04	9.70E-05	1.10E-04
95%	5.50E-04	2.20E-04	1.70E-04	1.40E-04	1.70E-04
99%	1.20E-03	4.70E-04	3.60E-04	3.10E-04	3.50E-04
99.9%	2.40E-03	1.00E-03	8.60E-04	5.70E-04	6.90E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 1.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Chariton Municipal Water Works, Chariton, Lucas County, Iowa					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	8.10E-06	5.40E-06	6.80E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.70E-06	1.20E-05
10%	8.00E-06	2.50E-05	1.50E-05	1.30E-05	1.50E-05
25%	4.00E-05	3.50E-05	2.30E-05	2.10E-05	2.30E-05
50%	1.10E-04	5.60E-05	3.90E-05	3.50E-05	3.80E-05
75%	2.20E-04	9.00E-05	6.80E-05	5.80E-05	6.40E-05
90%	3.90E-04	1.50E-04	1.20E-04	9.80E-05	1.10E-04
95%	5.30E-04	2.20E-04	1.70E-04	1.40E-04	1.70E-04
99%	1.20E-03	4.20E-04	3.30E-04	2.90E-04	3.10E-04
99.9%	2.10E-03	8.20E-04	6.60E-04	4.60E-04	5.00E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 1.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Chariton Municipal Water Works, Chariton, Lucas County, Iowa					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.60E-05	7.90E-06	5.30E-06	6.50E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.30E-06	1.10E-05
10%	8.00E-06	2.50E-05	1.50E-05	1.20E-05	1.40E-05
25%	3.90E-05	3.40E-05	2.20E-05	2.00E-05	2.20E-05
50%	1.00E-04	5.40E-05	3.80E-05	3.40E-05	3.70E-05
75%	2.20E-04	8.90E-05	6.60E-05	5.70E-05	6.40E-05
90%	3.80E-04	1.50E-04	1.20E-04	9.80E-05	1.10E-04
95%	5.40E-04	2.20E-04	1.70E-04	1.40E-04	1.60E-04
99%	1.30E-03	4.30E-04	3.50E-04	2.90E-04	3.20E-04
99.9%	2.00E-03	8.60E-04	7.40E-04	5.00E-04	6.00E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 1.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Chariton Municipal Water Works, Chariton, Lucas County, Iowa					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.10E-05
5%					1.90E-05
10%					2.40E-05
25%					3.50E-05
50%					5.10E-05
75%					7.10E-05
90%					9.70E-05
95%					1.20E-04
99%					1.50E-04
99.9%					1.70E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 2.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Sorento Water Treatment Plant, Sorento, Bond County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				4.00E-06	
5%				6.50E-06	
10%				8.50E-06	
25%				1.40E-05	
50%				2.80E-05	
75%				7.20E-05	
90%				1.40E-04	
95%				2.00E-04	
99%				3.40E-04	
99.9%				5.20E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 2.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Sorento Water Treatment Plant, Sorento, Bond County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.30E-05	6.30E-06	4.50E-06	5.20E-06
5%	8.00E-06	1.90E-05	1.00E-05	7.00E-06	7.90E-06
10%	8.00E-06	2.20E-05	1.30E-05	9.20E-06	1.00E-05
25%	3.20E-05	3.00E-05	1.90E-05	1.50E-05	1.70E-05
50%	8.70E-05	4.90E-05	3.50E-05	3.00E-05	3.40E-05
75%	2.30E-04	1.00E-04	7.60E-05	7.10E-05	7.90E-05
90%	5.40E-04	2.00E-04	1.60E-04	1.40E-04	1.50E-04
95%	7.90E-04	2.90E-04	2.30E-04	1.90E-04	2.10E-04
99%	1.30E-03	5.00E-04	4.30E-04	3.20E-04	3.60E-04
99.9%	2.00E-03	8.90E-04	7.70E-04	5.10E-04	7.00E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 2.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Sorento Water Treatment Plant, Sorento, Bond County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.30E-05	6.80E-06	4.70E-06	5.50E-06
5%	8.00E-06	2.00E-05	1.10E-05	7.80E-06	8.70E-06
10%	8.00E-06	2.30E-05	1.30E-05	1.00E-05	1.10E-05
25%	3.60E-05	3.20E-05	2.00E-05	1.70E-05	1.90E-05
50%	9.70E-05	5.40E-05	3.80E-05	3.40E-05	3.80E-05
75%	2.50E-04	1.10E-04	8.10E-05	7.20E-05	8.10E-05
90%	5.00E-04	1.90E-04	1.50E-04	1.30E-04	1.40E-04
95%	7.20E-04	2.60E-04	2.10E-04	1.70E-04	1.90E-04
99%	1.20E-03	4.50E-04	3.80E-04	2.80E-04	3.20E-04
99.9%	1.80E-03	8.20E-04	7.00E-04	4.40E-04	7.20E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 2.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Sorento Water Treatment Plant, Sorento, Bond County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.30E-05	6.90E-06	4.60E-06	5.60E-06
5%	8.00E-06	1.90E-05	1.10E-05	7.80E-06	8.80E-06
10%	8.00E-06	2.30E-05	1.30E-05	1.00E-05	1.10E-05
25%	3.40E-05	3.10E-05	2.00E-05	1.60E-05	1.80E-05
50%	9.10E-05	5.00E-05	3.50E-05	3.00E-05	3.40E-05
75%	2.30E-04	1.00E-04	7.60E-05	6.80E-05	7.70E-05
90%	5.10E-04	2.00E-04	1.50E-04	1.30E-04	1.50E-04
95%	7.70E-04	2.80E-04	2.20E-04	1.90E-04	2.00E-04
99%	1.30E-03	4.60E-04	4.00E-04	3.00E-04	3.40E-04
99.9%	1.80E-03	7.90E-04	7.30E-04	4.40E-04	6.60E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 2.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Sorento Water Treatment Plant, Sorento, Bond County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.20E-05
5%					2.10E-05
10%					2.60E-05
25%					3.90E-05
50%					5.80E-05
75%					8.10E-05
90%					1.10E-04
95%					1.30E-04
99%					1.70E-04
99.9%					1.90E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 3.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Flora Water Treatment Plant, Flora, Clay County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				4.00E-06	
5%				6.00E-06	
10%				7.40E-06	
25%				1.10E-05	
50%				1.90E-05	
75%				5.20E-05	
90%				1.20E-04	
95%				2.00E-04	
99%				5.40E-04	
99.9%				8.80E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 3.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Flora Water Treatment Plant, Flora, Clay County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.00E-06	4.10E-06	4.80E-06
5%	8.00E-06	1.80E-05	9.70E-06	6.30E-06	7.20E-06
10%	8.00E-06	2.00E-05	1.20E-05	7.90E-06	9.00E-06
25%	2.60E-05	2.60E-05	1.60E-05	1.20E-05	1.30E-05
50%	6.50E-05	3.90E-05	2.70E-05	2.20E-05	2.50E-05
75%	1.70E-04	8.10E-05	6.30E-05	5.50E-05	6.10E-05
90%	4.60E-04	1.90E-04	1.40E-04	1.30E-04	1.40E-04
95%	7.50E-04	3.00E-04	2.40E-04	2.10E-04	2.30E-04
99%	1.90E-03	6.50E-04	5.60E-04	4.30E-04	4.80E-04
99.9%	3.20E-03	1.20E-03	1.10E-03	6.90E-04	1.10E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 3.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Flora Water Treatment Plant, Flora, Clay County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.30E-05	6.40E-06	4.40E-06	5.10E-06
5%	8.00E-06	1.80E-05	1.00E-05	6.90E-06	8.00E-06
10%	8.00E-06	2.10E-05	1.20E-05	8.80E-06	1.00E-05
25%	2.90E-05	2.80E-05	1.70E-05	1.30E-05	1.50E-05
50%	7.50E-05	4.40E-05	3.00E-05	2.60E-05	2.90E-05
75%	2.00E-04	9.30E-05	7.00E-05	6.30E-05	6.90E-05
90%	5.00E-04	1.90E-04	1.50E-04	1.30E-04	1.40E-04
95%	7.60E-04	2.90E-04	2.30E-04	1.90E-04	2.10E-04
99%	1.60E-03	5.40E-04	4.60E-04	3.40E-04	4.00E-04
99.9%	2.10E-03	8.80E-04	8.50E-04	5.40E-04	8.10E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 3.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Flora Water Treatment Plant, Flora, Clay County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.40E-06	4.40E-06	5.10E-06
5%	8.00E-06	1.80E-05	1.00E-05	6.90E-06	7.90E-06
10%	8.00E-06	2.10E-05	1.20E-05	8.70E-06	9.80E-06
25%	2.90E-05	2.70E-05	1.70E-05	1.30E-05	1.50E-05
50%	7.30E-05	4.30E-05	3.00E-05	2.50E-05	2.80E-05
75%	1.90E-04	8.60E-05	6.50E-05	5.70E-05	6.30E-05
90%	4.70E-04	1.80E-04	1.40E-04	1.30E-04	1.40E-04
95%	7.60E-04	2.90E-04	2.30E-04	2.00E-04	2.20E-04
99%	1.60E-03	5.60E-04	4.60E-04	3.60E-04	4.00E-04
99.9%	2.10E-03	8.90E-04	8.00E-04	5.50E-04	7.60E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 3.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Flora Water Treatment Plant, Flora, Clay County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.10E-05
5%					2.00E-05
10%					2.50E-05
25%					3.70E-05
50%					5.40E-05
75%					7.60E-05
90%					1.00E-04
95%					1.30E-04
99%					1.60E-04
99.9%					1.80E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 4.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

W. Salem Water Treatment Plant, West Salem, Edwards County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.00E-06	
5%				8.70E-06	
10%				1.30E-05	
25%				2.40E-05	
50%				5.00E-05	
75%				1.00E-04	
90%				1.80E-04	
95%				2.50E-04	
99%				4.80E-04	
99.9%				7.50E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 4.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

W. Salem Water Treatment Plant, West Salem, Edwards County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	8.20E-06	3.10E-06	4.90E-06
5%	8.00E-06	2.20E-05	1.20E-05	9.90E-06	1.20E-05
10%	8.00E-06	2.80E-05	1.60E-05	1.40E-05	1.70E-05
25%	5.30E-05	4.30E-05	2.80E-05	2.70E-05	3.00E-05
50%	1.50E-04	7.80E-05	5.50E-05	5.30E-05	5.80E-05
75%	3.70E-04	1.40E-04	1.10E-04	1.00E-04	1.10E-04
90%	7.00E-04	2.60E-04	2.10E-04	1.70E-04	1.90E-04
95%	1.00E-03	3.70E-04	3.00E-04	2.40E-04	2.70E-04
99%	1.80E-03	6.70E-04	5.40E-04	4.30E-04	5.00E-04
99.9%	3.30E-03	1.20E-03	1.00E-03	7.70E-04	1.10E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 4.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

W. Salem Water Treatment Plant, West Salem, Edwards County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	6.70E-06	7.60E-06
5%	8.00E-06	2.40E-05	1.30E-05	1.20E-05	1.40E-05
10%	8.00E-06	3.00E-05	1.80E-05	1.70E-05	2.00E-05
25%	6.00E-05	4.70E-05	3.10E-05	3.10E-05	3.40E-05
50%	1.70E-04	8.10E-05	5.90E-05	5.60E-05	6.10E-05
75%	3.70E-04	1.40E-04	1.10E-04	9.90E-05	1.10E-04
90%	6.80E-04	2.50E-04	2.00E-04	1.60E-04	1.80E-04
95%	9.00E-04	3.50E-04	2.80E-04	2.20E-04	2.50E-04
99%	1.60E-03	6.10E-04	5.00E-04	3.90E-04	4.50E-04
99.9%	2.60E-03	1.20E-03	9.00E-04	6.20E-04	8.20E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 4.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

W. Salem Water Treatment Plant, West Salem, Edwards County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	6.50E-06	7.80E-06
5%	8.00E-06	2.40E-05	1.40E-05	1.30E-05	1.50E-05
10%	8.00E-06	3.00E-05	1.80E-05	1.70E-05	2.00E-05
25%	5.70E-05	4.50E-05	3.00E-05	2.90E-05	3.30E-05
50%	1.60E-04	7.90E-05	5.60E-05	5.20E-05	5.80E-05
75%	3.60E-04	1.40E-04	1.10E-04	9.80E-05	1.10E-04
90%	6.70E-04	2.50E-04	1.90E-04	1.70E-04	1.90E-04
95%	9.60E-04	3.40E-04	2.80E-04	2.20E-04	2.50E-04
99%	1.60E-03	5.90E-04	4.90E-04	3.50E-04	4.10E-04
99.9%	2.20E-03	9.70E-04	8.70E-04	5.20E-04	8.40E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 4.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

W. Salem Water Treatment Plant, West Salem, Edwards County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.50E-05
5%					2.80E-05
10%					3.60E-05
25%					5.50E-05
50%					8.20E-05
75%					1.10E-04
90%					1.60E-04
95%					1.90E-04
99%					2.50E-04
99.9%					2.80E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 5.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Farnia Water Treatment Plant, Farnia, Fayette County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				5.90E-06	
5%				1.60E-05	
10%				2.40E-05	
25%				4.10E-05	
50%				6.80E-05	
75%				1.10E-04	
90%				1.70E-04	
95%				2.40E-04	
99%				4.60E-04	
99.9%				9.10E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 5.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Farnia Water Treatment Plant, Farnia, Fayette County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	8.50E-06	9.10E-06
5%	8.00E-06	2.90E-05	1.80E-05	1.80E-05	2.20E-05
10%	8.00E-06	3.80E-05	2.40E-05	2.60E-05	3.00E-05
25%	7.60E-05	5.90E-05	4.20E-05	4.20E-05	4.60E-05
50%	2.20E-04	9.80E-05	7.30E-05	6.90E-05	7.40E-05
75%	4.40E-04	1.70E-04	1.30E-04	1.10E-04	1.20E-04
90%	7.30E-04	2.70E-04	2.10E-04	1.70E-04	1.90E-04
95%	9.60E-04	3.60E-04	2.90E-04	2.30E-04	2.60E-04
99%	1.80E-03	6.60E-04	5.60E-04	4.30E-04	5.00E-04
99.9%	3.10E-03	1.30E-03	1.20E-03	7.80E-04	1.00E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 5.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Farnia Water Treatment Plant, Farnia, Fayette County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	8.60E-06	9.70E-06
5%	8.00E-06	3.00E-05	1.80E-05	1.90E-05	2.20E-05
10%	8.00E-06	3.80E-05	2.50E-05	2.70E-05	3.00E-05
25%	7.80E-05	6.00E-05	4.20E-05	4.30E-05	4.70E-05
50%	2.30E-04	9.90E-05	7.40E-05	7.10E-05	7.60E-05
75%	4.40E-04	1.70E-04	1.30E-04	1.10E-04	1.20E-04
90%	7.30E-04	2.70E-04	2.20E-04	1.70E-04	1.90E-04
95%	9.60E-04	3.60E-04	2.90E-04	2.30E-04	2.60E-04
99%	1.80E-03	6.40E-04	5.30E-04	4.10E-04	4.60E-04
99.9%	2.80E-03	1.00E-03	9.60E-04	6.80E-04	8.90E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 5.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Farnia Water Treatment Plant, Farnia, Fayette County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	8.60E-06	9.50E-06
5%	8.00E-06	3.00E-05	1.80E-05	1.90E-05	2.20E-05
10%	8.00E-06	3.80E-05	2.50E-05	2.70E-05	3.00E-05
25%	7.60E-05	6.00E-05	4.20E-05	4.30E-05	4.70E-05
50%	2.30E-04	9.80E-05	7.40E-05	7.10E-05	7.60E-05
75%	4.40E-04	1.70E-04	1.30E-04	1.10E-04	1.20E-04
90%	7.30E-04	2.70E-04	2.10E-04	1.70E-04	1.90E-04
95%	9.80E-04	3.60E-04	2.90E-04	2.40E-04	2.60E-04
99%	1.80E-03	6.10E-04	5.00E-04	3.90E-04	4.40E-04
99.9%	2.50E-03	9.60E-04	8.90E-04	6.00E-04	9.50E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 5.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Farnia Water Treatment Plant, Farnia, Fayette County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.70E-05
5%					3.10E-05
10%					4.10E-05
25%					6.20E-05
50%					9.30E-05
75%					1.30E-04
90%					1.80E-04
95%					2.20E-04
99%					2.80E-04
99.9%					3.20E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 6.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

White Hall Water Treatment Plant, White Hall, Greene County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.60E-06	
5%				5.70E-06	
10%				7.00E-06	
25%				1.00E-05	
50%				2.00E-05	
75%				6.80E-05	
90%				2.00E-04	
95%				3.10E-04	
99%				5.80E-04	
99.9%				8.30E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 6.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

White Hall Water Treatment Plant, White Hall, Greene County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.20E-06	4.10E-06	4.60E-06
5%	8.00E-06	1.80E-05	9.60E-06	6.10E-06	6.70E-06
10%	8.00E-06	2.00E-05	1.10E-05	7.40E-06	8.30E-06
25%	2.50E-05	2.50E-05	1.50E-05	1.10E-05	1.30E-05
50%	6.40E-05	4.00E-05	2.70E-05	2.20E-05	2.60E-05
75%	2.00E-04	9.70E-05	7.20E-05	6.60E-05	7.30E-05
90%	7.10E-04	2.70E-04	2.10E-04	2.00E-04	2.20E-04
95%	1.20E-03	4.40E-04	3.30E-04	3.10E-04	3.40E-04
99%	2.50E-03	8.90E-04	7.00E-04	5.70E-04	6.40E-04
99.9%	3.50E-03	1.50E-03	1.20E-03	8.00E-04	1.30E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 6.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

White Hall Water Treatment Plant, White Hall, Greene County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.20E-06	4.10E-06	4.60E-06
5%	8.00E-06	1.80E-05	9.70E-06	6.10E-06	6.80E-06
10%	8.00E-06	2.00E-05	1.10E-05	7.60E-06	8.50E-06
25%	2.50E-05	2.60E-05	1.60E-05	1.10E-05	1.30E-05
50%	6.80E-05	4.20E-05	2.90E-05	2.30E-05	2.70E-05
75%	2.20E-04	1.00E-04	7.80E-05	7.40E-05	8.00E-05
90%	7.20E-04	2.70E-04	2.00E-04	2.00E-04	2.20E-04
95%	1.20E-03	4.30E-04	3.30E-04	3.00E-04	3.30E-04
99%	2.40E-03	8.00E-04	6.70E-04	5.30E-04	6.10E-04
99.9%	3.30E-03	1.50E-03	1.20E-03	7.70E-04	1.30E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 6.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

White Hall Water Treatment Plant, White Hall, Greene County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.30E-06	4.20E-06	4.70E-06
5%	8.00E-06	1.80E-05	9.70E-06	6.20E-06	6.90E-06
10%	8.00E-06	2.00E-05	1.10E-05	7.70E-06	8.60E-06
25%	2.60E-05	2.60E-05	1.60E-05	1.20E-05	1.30E-05
50%	7.00E-05	4.30E-05	3.00E-05	2.40E-05	2.80E-05
75%	2.20E-04	1.10E-04	8.00E-05	7.40E-05	8.20E-05
90%	7.50E-04	2.70E-04	2.10E-04	1.90E-04	2.10E-04
95%	1.20E-03	4.30E-04	3.30E-04	3.00E-04	3.30E-04
99%	2.40E-03	8.50E-04	6.80E-04	5.30E-04	6.20E-04
99.9%	3.30E-03	1.40E-03	1.20E-03	7.60E-04	1.30E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 6.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

White Hall Water Treatment Plant, White Hall, Greene County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.30E-05
5%					2.40E-05
10%					3.10E-05
25%					4.60E-05
50%					6.90E-05
75%					9.60E-05
90%					1.30E-04
95%					1.60E-04
99%					2.10E-04
99.9%					2.30E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 7.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Carlinville Water Works, Carlinville, Macoupin County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				5.40E-06	
5%				9.70E-06	
10%				1.30E-05	
25%				2.30E-05	
50%				4.60E-05	
75%				9.60E-05	
90%				1.90E-04	
95%				2.80E-04	
99%				5.00E-04	
99.9%				9.40E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 7.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Carlinville Water Works, Carlinville, Macoupin County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	6.00E-06	7.50E-06
5%	8.00E-06	2.30E-05	1.30E-05	1.10E-05	1.30E-05
10%	8.00E-06	2.80E-05	1.70E-05	1.60E-05	1.80E-05
25%	5.30E-05	4.30E-05	2.90E-05	2.60E-05	2.90E-05
50%	1.50E-04	7.40E-05	5.40E-05	4.90E-05	5.40E-05
75%	3.50E-04	1.40E-04	1.10E-04	1.00E-04	1.10E-04
90%	7.60E-04	2.80E-04	2.20E-04	1.90E-04	2.10E-04
95%	1.10E-03	4.00E-04	3.10E-04	2.70E-04	2.90E-04
99%	1.80E-03	7.00E-04	5.80E-04	4.40E-04	4.90E-04
99.9%	2.80E-03	1.20E-03	1.10E-03	6.60E-04	9.70E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 7.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Carlinville Water Works, Carlinville, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	6.40E-06	7.90E-06
5%	8.00E-06	2.40E-05	1.40E-05	1.30E-05	1.40E-05
10%	8.00E-06	2.90E-05	1.80E-05	1.70E-05	1.90E-05
25%	5.90E-05	4.50E-05	3.10E-05	2.80E-05	3.10E-05
50%	1.60E-04	7.80E-05	5.70E-05	5.30E-05	5.90E-05
75%	3.70E-04	1.50E-04	1.20E-04	1.10E-04	1.20E-04
90%	7.60E-04	2.70E-04	2.10E-04	1.90E-04	2.00E-04
95%	1.00E-03	3.70E-04	3.00E-04	2.40E-04	2.60E-04
99%	1.50E-03	6.00E-04	5.30E-04	3.60E-04	4.30E-04
99.9%	2.10E-03	9.20E-04	7.80E-04	5.10E-04	7.90E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 7.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Carlinville Water Works, Carlinville, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	6.20E-06	7.70E-06
5%	8.00E-06	2.30E-05	1.30E-05	1.20E-05	1.40E-05
10%	8.00E-06	2.80E-05	1.80E-05	1.60E-05	1.80E-05
25%	5.40E-05	4.40E-05	3.00E-05	2.70E-05	3.00E-05
50%	1.50E-04	7.40E-05	5.40E-05	5.00E-05	5.50E-05
75%	3.40E-04	1.40E-04	1.10E-04	9.60E-05	1.10E-04
90%	7.20E-04	2.60E-04	2.10E-04	1.80E-04	2.00E-04
95%	1.10E-03	3.70E-04	3.00E-04	2.50E-04	2.80E-04
99%	1.70E-03	6.50E-04	5.60E-04	3.90E-04	4.50E-04
99.9%	2.30E-03	1.00E-03	9.10E-04	5.60E-04	8.60E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 7.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Carlinville Water Works, Carlinville, Macoupin County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.50E-05
5%					2.90E-05
10%					3.70E-05
25%					5.60E-05
50%					8.30E-05
75%					1.20E-04
90%					1.60E-04
95%					2.00E-04
99%					2.50E-04
99.9%					2.80E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 8.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Gillespie Water Treatment Plant, Gillespie, Macoupin County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				5.10E-06	
5%				8.30E-06	
10%				1.10E-05	
25%				1.80E-05	
50%				3.50E-05	
75%				6.80E-05	
90%				1.30E-04	
95%				2.20E-04	
99%				9.80E-04	
99.9%				1.90E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 8.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Gillespie Water Treatment Plant, Gillespie, Macoupin County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.50E-05	7.60E-06	5.20E-06	6.00E-06
5%	8.00E-06	2.10E-05	1.20E-05	8.90E-06	9.90E-06
10%	8.00E-06	2.40E-05	1.40E-05	1.20E-05	1.30E-05
25%	4.00E-05	3.50E-05	2.30E-05	2.00E-05	2.20E-05
50%	1.10E-04	5.70E-05	4.10E-05	3.70E-05	4.10E-05
75%	2.50E-04	1.10E-04	8.10E-05	7.00E-05	7.80E-05
90%	5.10E-04	2.00E-04	1.60E-04	1.30E-04	1.50E-04
95%	8.30E-04	3.30E-04	2.60E-04	2.30E-04	2.60E-04
99%	3.40E-03	1.10E-03	9.50E-04	9.20E-04	9.20E-04
99.9%	8.20E-03	3.00E-03	2.40E-03	1.70E-03	2.20E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 8.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Gillespie Water Treatment Plant, Gillespie, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.60E-05	7.70E-06	5.50E-06	6.50E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.80E-06	1.10E-05
10%	8.00E-06	2.50E-05	1.50E-05	1.30E-05	1.50E-05
25%	4.40E-05	3.60E-05	2.40E-05	2.10E-05	2.40E-05
50%	1.20E-04	6.10E-05	4.40E-05	3.90E-05	4.30E-05
75%	2.70E-04	1.10E-04	8.60E-05	7.40E-05	8.20E-05
90%	5.40E-04	2.20E-04	1.70E-04	1.40E-04	1.60E-04
95%	9.20E-04	3.70E-04	2.80E-04	2.60E-04	2.80E-04
99%	2.90E-03	1.00E-03	8.20E-04	7.70E-04	8.20E-04
99.9%	5.80E-03	2.10E-03	1.80E-03	1.40E-03	1.60E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 8.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Gillespie Water Treatment Plant, Gillespie, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.40E-05	7.50E-06	5.30E-06	6.30E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.10E-06	1.00E-05
10%	8.00E-06	2.50E-05	1.50E-05	1.20E-05	1.30E-05
25%	4.10E-05	3.50E-05	2.30E-05	2.00E-05	2.20E-05
50%	1.10E-04	5.80E-05	4.10E-05	3.70E-05	4.10E-05
75%	2.50E-04	1.00E-04	7.90E-05	6.70E-05	7.40E-05
90%	4.80E-04	1.90E-04	1.50E-04	1.20E-04	1.40E-04
95%	8.30E-04	3.50E-04	2.70E-04	2.60E-04	3.20E-04
99%	3.40E-03	1.10E-03	9.30E-04	8.60E-04	8.70E-04
99.9%	6.00E-03	2.50E-03	2.00E-03	1.40E-03	1.60E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 8.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Gillespie Water Treatment Plant, Gillespie, Macoupin County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.50E-05
5%					2.70E-05
10%					3.50E-05
25%					5.30E-05
50%					7.90E-05
75%					1.10E-04
90%					1.50E-04
95%					1.90E-04
99%					2.40E-04
99.9%					2.70E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 9.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Hettick Water Supply, Hettick, Macoupin County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				5.10E-06	
5%				9.00E-06	
10%				1.50E-05	
25%				3.50E-05	
50%				8.60E-05	
75%				2.10E-04	
90%				4.10E-04	
95%				5.80E-04	
99%				1.00E-03	
99.9%				2.00E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 9.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Hettick Water Supply, Hettick, Macoupin County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	5.60E-06	6.30E-06
5%	8.00E-06	2.30E-05	1.40E-05	1.10E-05	1.20E-05
10%	8.00E-06	3.10E-05	2.00E-05	1.80E-05	2.00E-05
25%	7.40E-05	5.80E-05	4.00E-05	3.90E-05	4.30E-05
50%	2.60E-04	1.20E-04	9.30E-05	8.90E-05	1.00E-04
75%	7.10E-04	2.80E-04	2.20E-04	2.10E-04	2.30E-04
90%	1.60E-03	5.80E-04	4.50E-04	4.00E-04	4.40E-04
95%	2.30E-03	8.10E-04	6.60E-04	5.70E-04	6.10E-04
99%	4.10E-03	1.50E-03	1.30E-03	9.70E-04	1.10E-03
99.9%	7.20E-03	2.50E-03	2.40E-03	1.80E-03	2.50E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 9.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Hettick Water Supply, Hettick, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	6.00E-06	7.00E-06
5%	8.00E-06	2.40E-05	1.40E-05	1.20E-05	1.30E-05
10%	8.00E-06	3.20E-05	2.00E-05	1.80E-05	2.10E-05
25%	7.90E-05	6.20E-05	4.30E-05	4.30E-05	4.80E-05
50%	2.70E-04	1.30E-04	1.00E-04	1.00E-04	1.10E-04
75%	7.60E-04	3.00E-04	2.30E-04	2.10E-04	2.40E-04
90%	1.50E-03	5.50E-04	4.30E-04	3.80E-04	4.20E-04
95%	2.20E-03	7.60E-04	6.30E-04	5.20E-04	5.70E-04
99%	3.50E-03	1.30E-03	1.10E-03	8.30E-04	9.50E-04
99.9%	5.10E-03	2.10E-03	1.80E-03	1.20E-03	1.80E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 9.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Hettick Water Supply, Hettick, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	6.70E-06	7.70E-06
5%	8.00E-06	2.50E-05	1.50E-05	1.30E-05	1.50E-05
10%	8.00E-06	3.30E-05	2.10E-05	2.00E-05	2.20E-05
25%	7.90E-05	5.90E-05	4.10E-05	4.00E-05	4.50E-05
50%	2.60E-04	1.20E-04	9.10E-05	8.80E-05	9.60E-05
75%	6.60E-04	2.60E-04	2.10E-04	2.00E-04	2.10E-04
90%	1.50E-03	5.40E-04	4.30E-04	3.80E-04	4.20E-04
95%	2.20E-03	7.70E-04	6.30E-04	5.30E-04	5.80E-04
99%	3.90E-03	1.50E-03	1.20E-03	9.30E-04	1.10E-03
99.9%	6.20E-03	2.30E-03	2.10E-03	1.50E-03	2.00E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 9.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Hettick Water Supply, Hettick, Macoupin County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					2.60E-05
5%					5.30E-05
10%					7.00E-05
25%					1.10E-04
50%					1.70E-04
75%					2.30E-04
90%					3.20E-04
95%					3.90E-04
99%					5.10E-04
99.9%					5.70E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 10.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Shipman Water Treatment Plant, Shipman, Macoupin County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.70E-06	
5%				7.60E-06	
10%				1.10E-05	
25%				2.20E-05	
50%				4.70E-05	
75%				1.20E-04	
90%				3.60E-04	
95%				5.90E-04	
99%				1.20E-03	
99.9%				1.80E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 10.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Shipman Water Treatment Plant, Shipman, Macoupin County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.40E-05	7.80E-06	5.10E-06	5.50E-06
5%	8.00E-06	2.00E-05	1.20E-05	8.20E-06	9.20E-06
10%	8.00E-06	2.40E-05	1.50E-05	1.20E-05	1.40E-05
25%	4.30E-05	3.90E-05	2.60E-05	2.40E-05	2.70E-05
50%	1.50E-04	7.50E-05	5.40E-05	4.90E-05	5.50E-05
75%	4.10E-04	1.80E-04	1.40E-04	1.30E-04	1.40E-04
90%	1.20E-03	5.00E-04	3.80E-04	3.50E-04	3.80E-04
95%	2.30E-03	8.10E-04	6.50E-04	5.80E-04	6.40E-04
99%	5.10E-03	1.70E-03	1.40E-03	1.10E-03	1.30E-03
99.9%	7.10E-03	2.90E-03	2.70E-03	1.80E-03	2.40E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	99.99%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 10.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Shipman Water Treatment Plant, Shipman, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.60E-05	8.80E-06	5.70E-06	6.70E-06
5%	8.00E-06	2.20E-05	1.30E-05	9.90E-06	1.20E-05
10%	8.00E-06	2.70E-05	1.70E-05	1.40E-05	1.60E-05
25%	5.10E-05	4.20E-05	2.80E-05	2.70E-05	2.90E-05
50%	1.60E-04	7.60E-05	5.60E-05	5.00E-05	5.50E-05
75%	4.10E-04	1.80E-04	1.40E-04	1.30E-04	1.50E-04
90%	1.20E-03	4.70E-04	3.80E-04	3.40E-04	3.60E-04
95%	2.10E-03	7.60E-04	6.10E-04	5.30E-04	5.90E-04
99%	4.50E-03	1.50E-03	1.20E-03	1.00E-03	1.20E-03
99.9%	6.90E-03	2.90E-03	2.80E-03	1.50E-03	2.80E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	99.98%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 10.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Shipman Water Treatment Plant, Shipman, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.50E-05	8.50E-06	5.60E-06	6.40E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.30E-06	1.10E-05
10%	8.00E-06	2.60E-05	1.60E-05	1.30E-05	1.50E-05
25%	4.70E-05	4.00E-05	2.70E-05	2.50E-05	2.80E-05
50%	1.60E-04	7.60E-05	5.50E-05	5.00E-05	5.50E-05
75%	4.00E-04	1.70E-04	1.30E-04	1.20E-04	1.30E-04
90%	1.20E-03	4.50E-04	3.40E-04	3.20E-04	3.40E-04
95%	2.00E-03	7.40E-04	6.00E-04	5.40E-04	5.90E-04
99%	4.90E-03	1.60E-03	1.20E-03	1.10E-03	1.20E-03
99.9%	6.80E-03	2.90E-03	2.70E-03	1.80E-03	2.30E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	99.99%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 10.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Shipman Water Treatment Plant, Shipman, Macoupin County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					2.20E-05
5%					4.30E-05
10%					5.60E-05
25%					8.70E-05
50%					1.30E-04
75%					1.90E-04
90%					2.50E-04
95%					3.10E-04
99%					4.00E-04
99.9%					4.50E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 11.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Palmyra-Modesto Water Commission, N Palmyra Twp, Macoupin County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				5.10E-06	
5%				9.10E-06	
10%				1.50E-05	
25%				3.20E-05	
50%				6.10E-05	
75%				1.20E-04	
90%				2.40E-04	
95%				3.80E-04	
99%				6.80E-04	
99.9%				1.10E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 11.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Palmyra-Modesto Water Commission, N Palmyra Twp, Macoupin County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	6.90E-06	8.30E-06
5%	8.00E-06	2.60E-05	1.50E-05	1.40E-05	1.60E-05
10%	8.00E-06	3.20E-05	2.00E-05	2.00E-05	2.20E-05
25%	6.80E-05	5.10E-05	3.50E-05	3.40E-05	3.80E-05
50%	1.90E-04	9.00E-05	6.70E-05	6.20E-05	6.90E-05
75%	4.40E-04	1.70E-04	1.40E-04	1.20E-04	1.30E-04
90%	9.10E-04	3.50E-04	2.80E-04	2.50E-04	2.70E-04
95%	1.50E-03	5.50E-04	4.40E-04	3.70E-04	4.10E-04
99%	2.80E-03	1.00E-03	8.90E-04	6.60E-04	7.60E-04
99.9%	4.30E-03	1.80E-03	1.50E-03	1.10E-03	1.40E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 11.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Palmyra-Modesto Water Commission, N Palmyra Twp, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	7.10E-06	9.00E-06
5%	8.00E-06	2.70E-05	1.60E-05	1.50E-05	1.80E-05
10%	8.00E-06	3.40E-05	2.20E-05	2.20E-05	2.40E-05
25%	7.10E-05	5.30E-05	3.70E-05	3.70E-05	4.00E-05
50%	2.00E-04	9.30E-05	6.90E-05	6.40E-05	7.10E-05
75%	4.40E-04	1.70E-04	1.40E-04	1.20E-04	1.30E-04
90%	8.70E-04	3.40E-04	2.60E-04	2.30E-04	2.50E-04
95%	1.40E-03	5.10E-04	4.20E-04	3.50E-04	3.90E-04
99%	2.90E-03	9.90E-04	8.50E-04	6.00E-04	6.90E-04
99.9%	4.10E-03	1.70E-03	1.60E-03	9.70E-04	1.50E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 11.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Palmyra-Modesto Water Commission, N Palmyra Twp, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	7.10E-06	8.30E-06
5%	8.00E-06	2.60E-05	1.60E-05	1.60E-05	1.70E-05
10%	8.00E-06	3.30E-05	2.10E-05	2.10E-05	2.40E-05
25%	6.90E-05	5.20E-05	3.60E-05	3.50E-05	3.90E-05
50%	2.00E-04	9.00E-05	6.70E-05	6.20E-05	6.90E-05
75%	4.30E-04	1.70E-04	1.30E-04	1.20E-04	1.30E-04
90%	8.80E-04	3.30E-04	2.60E-04	2.40E-04	2.50E-04
95%	1.40E-03	4.90E-04	3.80E-04	3.30E-04	3.60E-04
99%	2.60E-03	9.90E-04	8.10E-04	5.70E-04	6.40E-04
99.9%	4.30E-03	1.80E-03	1.60E-03	9.60E-04	1.50E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 11.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Palmyra-Modesto Water Commission, N Palmyra Twp, Macoupin County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.90E-05
5%					3.60E-05
10%					4.70E-05
25%					7.20E-05
50%					1.10E-04
75%					1.50E-04
90%					2.10E-04
95%					2.60E-04
99%					3.30E-04
99.9%					3.70E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 12.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

ADGPTV Water Commission, North Otter Twp, Macoupin County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				7.50E-06	
5%				1.50E-05	
10%				2.20E-05	
25%				3.90E-05	
50%				6.90E-05	
75%				1.20E-04	
90%				2.00E-04	
95%				2.90E-04	
99%				5.20E-04	
99.9%				9.60E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 12.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

ADGPTV Water Commission, North Otter Twp, Macoupin County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	8.10E-06	9.50E-06
5%	8.00E-06	2.90E-05	1.70E-05	1.70E-05	2.00E-05
10%	8.00E-06	3.70E-05	2.40E-05	2.50E-05	2.80E-05
25%	7.90E-05	6.00E-05	4.20E-05	4.20E-05	4.60E-05
50%	2.30E-04	1.00E-04	7.60E-05	7.20E-05	7.80E-05
75%	4.60E-04	1.80E-04	1.40E-04	1.20E-04	1.30E-04
90%	8.00E-04	3.00E-04	2.40E-04	2.00E-04	2.20E-04
95%	1.10E-03	4.00E-04	3.40E-04	2.70E-04	3.10E-04
99%	2.00E-03	7.40E-04	6.20E-04	4.70E-04	5.50E-04
99.9%	3.50E-03	1.30E-03	1.00E-03	7.60E-04	1.10E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 12.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

ADGPTV Water Commission, North Otter Twp, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	8.30E-06	9.70E-06
5%	8.00E-06	2.90E-05	1.80E-05	1.80E-05	2.10E-05
10%	8.00E-06	3.80E-05	2.50E-05	2.60E-05	2.90E-05
25%	8.20E-05	6.10E-05	4.20E-05	4.30E-05	4.70E-05
50%	2.30E-04	1.00E-04	7.70E-05	7.30E-05	8.00E-05
75%	4.70E-04	1.80E-04	1.40E-04	1.20E-04	1.30E-04
90%	7.90E-04	2.90E-04	2.30E-04	2.00E-04	2.10E-04
95%	1.10E-03	3.90E-04	3.20E-04	2.50E-04	2.80E-04
99%	1.70E-03	6.30E-04	5.40E-04	3.80E-04	4.60E-04
99.9%	2.30E-03	9.60E-04	8.70E-04	5.40E-04	9.90E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 12.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

ADGPTV Water Commission, North Otter Twp, Macoupin County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	9.00E-06	8.10E-06	9.40E-06
5%	8.00E-06	2.80E-05	1.70E-05	1.70E-05	1.90E-05
10%	8.00E-06	3.60E-05	2.40E-05	2.40E-05	2.70E-05
25%	7.80E-05	5.80E-05	4.00E-05	4.10E-05	4.50E-05
50%	2.20E-04	1.00E-04	7.40E-05	7.10E-05	7.70E-05
75%	4.60E-04	1.70E-04	1.30E-04	1.20E-04	1.30E-04
90%	7.70E-04	2.90E-04	2.30E-04	1.90E-04	2.10E-04
95%	1.00E-03	3.90E-04	3.10E-04	2.60E-04	2.80E-04
99%	1.90E-03	6.80E-04	5.70E-04	4.10E-04	4.80E-04
99.9%	2.60E-03	1.10E-03	9.40E-04	6.50E-04	1.00E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 12.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

ADGPTV Water Commission, North Otter Twp, Macoupin County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.70E-05
5%					3.30E-05
10%					4.30E-05
25%					6.60E-05
50%					9.90E-05
75%					1.40E-04
90%					1.90E-04
95%					2.40E-04
99%					3.00E-04
99.9%					3.40E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 13.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Kinmundy Water Treatment Plant, Kinmundy, Marion County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.90E-06	
5%				5.50E-06	
10%				6.80E-06	
25%				1.10E-05	
50%				2.00E-05	
75%				4.40E-05	
90%				1.20E-04	
95%				1.90E-04	
99%				3.90E-04	
99.9%				7.50E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 13.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Kinmundy Water Treatment Plant, Kinmundy, Marion County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.10E-06	4.00E-06	4.50E-06
5%	8.00E-06	1.80E-05	9.70E-06	5.70E-06	6.30E-06
10%	8.00E-06	2.00E-05	1.10E-05	7.20E-06	8.00E-06
25%	2.30E-05	2.50E-05	1.60E-05	1.10E-05	1.30E-05
50%	6.40E-05	3.80E-05	2.60E-05	2.10E-05	2.40E-05
75%	1.50E-04	7.10E-05	5.40E-05	4.50E-05	5.10E-05
90%	4.10E-04	1.70E-04	1.30E-04	1.20E-04	1.30E-04
95%	7.30E-04	2.80E-04	2.20E-04	1.80E-04	2.00E-04
99%	1.60E-03	5.60E-04	4.50E-04	3.50E-04	4.20E-04
99.9%	2.70E-03	1.00E-03	9.00E-04	7.20E-04	9.20E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 13.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Kinmundy Water Treatment Plant, Kinmundy, Marion County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.40E-06	4.10E-06	4.70E-06
5%	8.00E-06	1.80E-05	1.00E-05	6.10E-06	6.90E-06
10%	8.00E-06	2.00E-05	1.20E-05	7.80E-06	9.00E-06
25%	2.60E-05	2.70E-05	1.70E-05	1.30E-05	1.50E-05
50%	7.00E-05	4.10E-05	2.80E-05	2.30E-05	2.60E-05
75%	1.60E-04	7.70E-05	5.80E-05	5.10E-05	5.70E-05
90%	4.10E-04	1.70E-04	1.30E-04	1.10E-04	1.20E-04
95%	6.90E-04	2.50E-04	2.10E-04	1.70E-04	1.90E-04
99%	1.40E-03	5.00E-04	4.20E-04	3.00E-04	3.90E-04
99.9%	2.30E-03	9.40E-04	8.50E-04	5.30E-04	8.50E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 13.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Kinmundy Water Treatment Plant, Kinmundy, Marion County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.40E-06	4.30E-06	4.90E-06
5%	8.00E-06	1.80E-05	1.00E-05	6.50E-06	7.30E-06
10%	8.00E-06	2.10E-05	1.20E-05	8.20E-06	9.20E-06
25%	2.70E-05	2.70E-05	1.70E-05	1.30E-05	1.50E-05
50%	7.00E-05	4.00E-05	2.80E-05	2.30E-05	2.60E-05
75%	1.60E-04	7.60E-05	5.70E-05	5.10E-05	5.60E-05
90%	4.30E-04	1.70E-04	1.30E-04	1.10E-04	1.20E-04
95%	6.80E-04	2.60E-04	2.10E-04	1.70E-04	1.80E-04
99%	1.50E-03	5.20E-04	4.20E-04	3.40E-04	3.70E-04
99.9%	2.50E-03	9.30E-04	8.30E-04	6.00E-04	8.10E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 13.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Kinmundy Water Treatment Plant, Kinmundy, Marion County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.10E-05
5%					1.80E-05
10%					2.30E-05
25%					3.30E-05
50%					4.90E-05
75%					6.80E-05
90%					9.20E-05
95%					1.10E-04
99%					1.40E-04
99.9%					1.60E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 14.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Salem, Marion County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.50E-06	
5%				5.30E-06	
10%				6.70E-06	
25%				1.10E-05	
50%				2.20E-05	
75%				5.30E-05	
90%				1.80E-04	
95%				4.40E-04	
99%				1.50E-03	
99.9%				3.00E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 14.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Salem, Marion County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.00E-06	4.00E-06	4.60E-06
5%	8.00E-06	1.80E-05	9.80E-06	6.00E-06	6.60E-06
10%	8.00E-06	2.00E-05	1.20E-05	7.50E-06	8.30E-06
25%	2.60E-05	2.60E-05	1.60E-05	1.20E-05	1.40E-05
50%	7.10E-05	4.30E-05	3.00E-05	2.50E-05	2.90E-05
75%	2.10E-04	9.20E-05	7.10E-05	6.10E-05	6.70E-05
90%	7.10E-04	3.10E-04	2.30E-04	2.30E-04	2.50E-04
95%	1.60E-03	6.40E-04	5.10E-04	4.50E-04	5.00E-04
99%	5.10E-03	1.90E-03	1.60E-03	1.30E-03	1.50E-03
99.9%	1.20E-02	4.50E-03	4.20E-03	2.70E-03	3.40E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	99.95%	99.98%	99.99%	100.00%	99.96%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 14.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Salem, Marion County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.30E-05	6.40E-06	4.30E-06	4.90E-06
5%	8.00E-06	1.80E-05	1.00E-05	6.40E-06	7.20E-06
10%	8.00E-06	2.10E-05	1.20E-05	8.30E-06	9.30E-06
25%	3.00E-05	2.80E-05	1.80E-05	1.40E-05	1.60E-05
50%	8.30E-05	4.80E-05	3.40E-05	2.90E-05	3.30E-05
75%	2.40E-04	1.10E-04	8.60E-05	7.40E-05	8.10E-05
90%	8.90E-04	3.70E-04	2.80E-04	2.70E-04	2.90E-04
95%	1.80E-03	6.50E-04	5.40E-04	5.00E-04	5.30E-04
99%	4.40E-03	1.50E-03	1.30E-03	9.60E-04	1.10E-03
99.9%	7.10E-03	2.80E-03	2.30E-03	1.70E-03	2.20E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	99.99%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 14.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Salem, Marion County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.30E-06	4.30E-06	4.80E-06
5%	8.00E-06	1.80E-05	1.00E-05	6.40E-06	7.10E-06
10%	8.00E-06	2.10E-05	1.20E-05	8.00E-06	9.10E-06
25%	2.80E-05	2.70E-05	1.70E-05	1.30E-05	1.50E-05
50%	7.40E-05	4.40E-05	3.10E-05	2.50E-05	2.90E-05
75%	2.20E-04	9.70E-05	7.30E-05	6.50E-05	7.20E-05
90%	6.80E-04	3.00E-04	2.30E-04	2.10E-04	2.30E-04
95%	1.70E-03	7.20E-04	5.40E-04	5.40E-04	5.80E-04
99%	5.20E-03	1.70E-03	1.40E-03	1.10E-03	1.20E-03
99.9%	7.20E-03	3.10E-03	2.70E-03	1.70E-03	2.40E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	99.99%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 14.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Salem, Marion County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.70E-05
5%					3.40E-05
10%					4.40E-05
25%					6.70E-05
50%					1.00E-04
75%					1.40E-04
90%					1.90E-04
95%					2.40E-04
99%					3.10E-04
99.9%					3.40E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 15.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Centralia Water Treatment Plant, Centralia, Marion County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				4.10E-06	
5%				5.90E-06	
10%				7.50E-06	
25%				1.40E-05	
50%				3.90E-05	
75%				9.30E-05	
90%				2.10E-04	
95%				3.30E-04	
99%				6.90E-04	
99.9%				1.20E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 15.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Centralia Water Treatment Plant, Centralia, Marion County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.40E-06	4.20E-06	4.80E-06
5%	8.00E-06	1.80E-05	1.00E-05	6.10E-06	6.80E-06
10%	8.00E-06	2.10E-05	1.20E-05	7.80E-06	8.90E-06
25%	3.20E-05	3.00E-05	1.90E-05	1.50E-05	1.80E-05
50%	1.10E-04	6.20E-05	4.50E-05	4.10E-05	4.60E-05
75%	3.30E-04	1.40E-04	1.10E-04	9.70E-05	1.10E-04
90%	8.00E-04	3.00E-04	2.30E-04	2.10E-04	2.30E-04
95%	1.30E-03	4.60E-04	3.70E-04	3.20E-04	3.50E-04
99%	2.50E-03	9.30E-04	7.50E-04	6.60E-04	7.30E-04
99.9%	4.80E-03	2.10E-03	1.80E-03	1.10E-03	1.60E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 15.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Centralia Water Treatment Plant, Centralia, Marion County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.40E-05	7.30E-06	4.70E-06	5.30E-06
5%	8.00E-06	2.00E-05	1.10E-05	7.40E-06	8.20E-06
10%	8.00E-06	2.30E-05	1.40E-05	1.00E-05	1.20E-05
25%	4.10E-05	3.70E-05	2.50E-05	2.20E-05	2.50E-05
50%	1.40E-04	7.20E-05	5.30E-05	4.90E-05	5.40E-05
75%	3.60E-04	1.50E-04	1.20E-04	1.00E-04	1.10E-04
90%	7.80E-04	2.80E-04	2.30E-04	2.00E-04	2.20E-04
95%	1.20E-03	4.20E-04	3.30E-04	2.80E-04	3.10E-04
99%	2.10E-03	7.80E-04	6.50E-04	4.90E-04	5.50E-04
99.9%	3.10E-03	1.40E-03	1.20E-03	7.50E-04	1.10E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 15.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Centralia Water Treatment Plant, Centralia, Marion County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.80E-06	4.40E-06	4.90E-06
5%	8.00E-06	1.90E-05	1.00E-05	6.40E-06	7.30E-06
10%	8.00E-06	2.20E-05	1.20E-05	8.40E-06	9.70E-06
25%	3.40E-05	3.10E-05	2.00E-05	1.60E-05	1.90E-05
50%	1.10E-04	6.40E-05	4.70E-05	4.30E-05	4.80E-05
75%	3.50E-04	1.40E-04	1.10E-04	1.00E-04	1.10E-04
90%	7.90E-04	3.00E-04	2.30E-04	2.10E-04	2.20E-04
95%	1.20E-03	4.30E-04	3.40E-04	2.90E-04	3.20E-04
99%	2.20E-03	7.80E-04	6.80E-04	4.80E-04	5.60E-04
99.9%	2.90E-03	1.30E-03	1.20E-03	7.00E-04	1.20E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 15.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Centralia Water Treatment Plant, Centralia, Marion County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.60E-05
5%					2.90E-05
10%					3.80E-05
25%					5.80E-05
50%					8.60E-05
75%					1.20E-04
90%					1.70E-04
95%					2.00E-04
99%					2.60E-04
99.9%					2.90E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 16.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Hillsboro Water Treatment Plant, Hillsboro, Montgomery County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				4.50E-06	
5%				6.90E-06	
10%				9.50E-06	
25%				2.10E-05	
50%				4.90E-05	
75%				9.40E-05	
90%				1.60E-04	
95%				2.20E-04	
99%				5.10E-04	
99.9%				1.10E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 16.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Hillsboro Water Treatment Plant, Hillsboro, Montgomery County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.40E-05	7.30E-06	4.70E-06	5.60E-06
5%	8.00E-06	2.00E-05	1.10E-05	7.90E-06	8.80E-06
10%	8.00E-06	2.40E-05	1.40E-05	1.10E-05	1.20E-05
25%	4.40E-05	3.80E-05	2.60E-05	2.30E-05	2.70E-05
50%	1.40E-04	7.40E-05	5.40E-05	5.20E-05	5.60E-05
75%	3.50E-04	1.40E-04	1.10E-04	9.60E-05	1.00E-04
90%	6.40E-04	2.40E-04	1.90E-04	1.50E-04	1.70E-04
95%	8.90E-04	3.30E-04	2.80E-04	2.20E-04	2.40E-04
99%	2.10E-03	6.90E-04	5.80E-04	5.10E-04	5.50E-04
99.9%	5.60E-03	1.60E-03	1.50E-03	1.10E-03	1.40E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	99.99%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 16.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Hillsboro Water Treatment Plant, Hillsboro, Montgomery County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.50E-05	7.80E-06	5.40E-06	6.10E-06
5%	8.00E-06	2.10E-05	1.20E-05	8.70E-06	9.80E-06
10%	8.00E-06	2.60E-05	1.50E-05	1.20E-05	1.40E-05
25%	4.90E-05	4.10E-05	2.70E-05	2.60E-05	2.90E-05
50%	1.50E-04	7.80E-05	5.60E-05	5.50E-05	6.00E-05
75%	3.70E-04	1.40E-04	1.10E-04	9.90E-05	1.10E-04
90%	6.60E-04	2.40E-04	1.90E-04	1.60E-04	1.70E-04
95%	8.70E-04	3.30E-04	2.70E-04	2.20E-04	2.40E-04
99%	1.70E-03	6.30E-04	5.10E-04	3.80E-04	4.60E-04
99.9%	3.10E-03	1.10E-03	1.00E-03	7.70E-04	9.00E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 16.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Hillsboro Water Treatment Plant, Hillsboro, Montgomery County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.60E-05	8.10E-06	5.40E-06	6.10E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.20E-06	1.10E-05
10%	8.00E-06	2.60E-05	1.60E-05	1.30E-05	1.50E-05
25%	4.90E-05	4.00E-05	2.70E-05	2.50E-05	2.80E-05
50%	1.40E-04	7.40E-05	5.40E-05	5.00E-05	5.60E-05
75%	3.50E-04	1.30E-04	1.10E-04	9.40E-05	1.00E-04
90%	6.60E-04	2.30E-04	1.90E-04	1.60E-04	1.70E-04
95%	8.80E-04	3.30E-04	2.70E-04	2.10E-04	2.30E-04
99%	1.60E-03	6.40E-04	5.20E-04	3.80E-04	4.50E-04
99.9%	3.00E-03	1.30E-03	1.10E-03	7.20E-04	9.90E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 16.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Hillsboro Water Treatment Plant, Hillsboro, Montgomery County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.40E-05
5%					2.70E-05
10%					3.40E-05
25%					5.20E-05
50%					7.80E-05
75%					1.10E-04
90%					1.50E-04
95%					1.80E-04
99%					2.40E-04
99.9%					2.60E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 17.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Wayne City Water Plant, Wayne City, Wayne County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				4.60E-06	
5%				7.40E-06	
10%				9.60E-06	
25%				1.50E-05	
50%				2.70E-05	
75%				5.30E-05	
90%				1.10E-04	
95%				1.90E-04	
99%				5.00E-04	
99.9%				1.40E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 17.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Wayne City Water Plant, Wayne City, Wayne County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.40E-05	7.20E-06	5.10E-06	6.00E-06
5%	8.00E-06	2.00E-05	1.10E-05	8.40E-06	9.70E-06
10%	8.00E-06	2.30E-05	1.40E-05	1.10E-05	1.30E-05
25%	3.50E-05	3.20E-05	2.00E-05	1.70E-05	1.90E-05
50%	9.10E-05	4.90E-05	3.40E-05	2.90E-05	3.20E-05
75%	2.00E-04	8.90E-05	6.80E-05	5.90E-05	6.50E-05
90%	4.70E-04	1.80E-04	1.40E-04	1.20E-04	1.40E-04
95%	7.50E-04	2.80E-04	2.20E-04	1.90E-04	2.10E-04
99%	1.60E-03	5.60E-04	4.60E-04	4.00E-04	4.50E-04
99.9%	4.20E-03	1.60E-03	1.10E-03	1.10E-03	1.10E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 17.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Wayne City Water Plant, Wayne City, Wayne County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.40E-05	7.60E-06	5.40E-06	6.30E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.00E-06	1.00E-05
10%	8.00E-06	2.40E-05	1.40E-05	1.20E-05	1.40E-05
25%	3.80E-05	3.40E-05	2.20E-05	1.80E-05	2.10E-05
50%	1.00E-04	5.30E-05	3.80E-05	3.30E-05	3.70E-05
75%	2.40E-04	1.00E-04	7.80E-05	7.10E-05	7.70E-05
90%	5.10E-04	1.90E-04	1.50E-04	1.30E-04	1.40E-04
95%	7.60E-04	2.70E-04	2.20E-04	1.80E-04	2.00E-04
99%	1.20E-03	4.70E-04	3.90E-04	2.90E-04	3.70E-04
99.9%	2.20E-03	9.20E-04	8.10E-04	5.20E-04	8.10E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 17.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Wayne City Water Plant, Wayne City, Wayne County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.40E-05	7.70E-06	5.20E-06	6.40E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.20E-06	1.10E-05
10%	8.00E-06	2.40E-05	1.40E-05	1.20E-05	1.40E-05
25%	3.70E-05	3.30E-05	2.10E-05	1.80E-05	2.00E-05
50%	9.90E-05	5.10E-05	3.60E-05	3.00E-05	3.40E-05
75%	2.20E-04	9.80E-05	7.40E-05	6.80E-05	7.50E-05
90%	5.30E-04	2.00E-04	1.50E-04	1.40E-04	1.50E-04
95%	7.90E-04	3.00E-04	2.40E-04	1.90E-04	2.10E-04
99%	1.50E-03	5.40E-04	4.50E-04	3.40E-04	4.00E-04
99.9%	2.60E-03	9.70E-04	8.70E-04	6.20E-04	7.50E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 17.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Wayne City Water Plant, Wayne City, Wayne County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.20E-05
5%					2.10E-05
10%					2.60E-05
25%					3.90E-05
50%					5.80E-05
75%					8.10E-05
90%					1.10E-04
95%					1.30E-04
99%					1.70E-04
99.9%					1.90E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 18.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Louisville Water Treatment Plant, Louisville, Clay County, Illinois					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.90E-06	
5%				6.10E-06	
10%				7.50E-06	
25%				1.10E-05	
50%				1.80E-05	
75%				6.00E-05	
90%				2.10E-04	
95%				3.30E-04	
99%				6.10E-04	
99.9%				1.00E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 18.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Louisville Water Treatment Plant, Louisville, Clay County, Illinois					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	5.90E-06	4.10E-06	4.80E-06
5%	8.00E-06	1.80E-05	9.80E-06	6.40E-06	7.10E-06
10%	8.00E-06	2.00E-05	1.20E-05	7.80E-06	8.70E-06
25%	2.60E-05	2.50E-05	1.60E-05	1.20E-05	1.30E-05
50%	6.70E-05	4.00E-05	2.70E-05	2.20E-05	2.50E-05
75%	2.00E-04	1.00E-04	7.60E-05	7.30E-05	8.00E-05
90%	7.30E-04	2.80E-04	2.20E-04	2.00E-04	2.20E-04
95%	1.20E-03	4.50E-04	3.60E-04	3.10E-04	3.40E-04
99%	2.60E-03	8.80E-04	7.50E-04	5.60E-04	6.40E-04
99.9%	3.90E-03	1.70E-03	1.60E-03	9.10E-04	1.30E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 18.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Louisville Water Treatment Plant, Louisville, Clay County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.10E-06	4.20E-06	4.90E-06
5%	8.00E-06	1.80E-05	1.00E-05	6.90E-06	7.70E-06
10%	8.00E-06	2.10E-05	1.20E-05	8.70E-06	9.50E-06
25%	3.00E-05	2.70E-05	1.70E-05	1.30E-05	1.50E-05
50%	7.60E-05	4.60E-05	3.30E-05	2.70E-05	3.20E-05
75%	2.80E-04	1.20E-04	9.30E-05	8.90E-05	9.90E-05
90%	7.10E-04	2.60E-04	2.10E-04	1.80E-04	2.00E-04
95%	1.10E-03	3.90E-04	3.20E-04	2.70E-04	2.90E-04
99%	2.10E-03	7.40E-04	6.30E-04	4.80E-04	5.20E-04
99.9%	3.00E-03	1.30E-03	1.20E-03	7.10E-04	1.00E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 18.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Louisville Water Treatment Plant, Louisville, Clay County, Illinois					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.20E-06	4.40E-06	5.00E-06
5%	8.00E-06	1.80E-05	1.00E-05	7.00E-06	7.80E-06
10%	8.00E-06	2.10E-05	1.20E-05	8.70E-06	9.80E-06
25%	2.80E-05	2.70E-05	1.70E-05	1.30E-05	1.50E-05
50%	7.60E-05	4.30E-05	3.00E-05	2.40E-05	2.80E-05
75%	1.90E-04	8.70E-05	6.60E-05	5.50E-05	6.40E-05
90%	7.20E-04	2.70E-04	2.10E-04	2.00E-04	2.20E-04
95%	1.20E-03	4.20E-04	3.20E-04	3.00E-04	3.10E-04
99%	2.10E-03	7.80E-04	6.30E-04	5.00E-04	5.30E-04
99.9%	3.20E-03	1.30E-03	1.20E-03	7.50E-04	1.00E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 18.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Louisville Water Treatment Plant, Louisville, Clay County, Illinois					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.40E-05
5%					2.50E-05
10%					3.30E-05
25%					4.90E-05
50%					7.30E-05
75%					1.00E-04
90%					1.40E-04
95%					1.70E-04
99%					2.20E-04
99.9%					2.50E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 19.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Holland Water Department, Holland, Dubois County, Indiana					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.80E-06	
5%				5.20E-06	
10%				6.40E-06	
25%				9.20E-06	
50%				1.60E-05	
75%				4.50E-05	
90%				1.30E-04	
95%				2.60E-04	
99%				5.40E-04	
99.9%				8.70E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 19.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Holland Water Department, Holland, Dubois County, Indiana					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	5.40E-06	3.80E-06	4.10E-06
5%	8.00E-06	1.70E-05	9.20E-06	5.50E-06	6.00E-06
10%	8.00E-06	1.90E-05	1.10E-05	6.70E-06	7.40E-06
25%	2.10E-05	2.30E-05	1.40E-05	9.50E-06	1.10E-05
50%	5.00E-05	3.30E-05	2.20E-05	1.60E-05	2.00E-05
75%	1.40E-04	6.90E-05	5.10E-05	4.40E-05	5.00E-05
90%	4.70E-04	1.80E-04	1.40E-04	1.30E-04	1.50E-04
95%	9.60E-04	3.40E-04	2.70E-04	2.60E-04	2.80E-04
99%	2.30E-03	8.00E-04	6.50E-04	5.10E-04	5.60E-04
99.9%	3.70E-03	1.60E-03	1.30E-03	8.30E-04	1.10E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 19.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Holland Water Department, Holland, Dubois County, Indiana					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	5.50E-06	3.90E-06	4.20E-06
5%	8.00E-06	1.70E-05	9.30E-06	5.50E-06	6.10E-06
10%	8.00E-06	1.90E-05	1.10E-05	6.80E-06	7.50E-06
25%	2.10E-05	2.40E-05	1.40E-05	1.00E-05	1.10E-05
50%	5.20E-05	3.40E-05	2.20E-05	1.70E-05	2.00E-05
75%	1.40E-04	7.00E-05	5.20E-05	4.70E-05	5.20E-05
90%	4.80E-04	1.90E-04	1.40E-04	1.20E-04	1.40E-04
95%	8.60E-04	3.20E-04	2.60E-04	2.40E-04	2.70E-04
99%	2.30E-03	7.80E-04	6.30E-04	4.90E-04	5.40E-04
99.9%	3.60E-03	1.50E-03	1.20E-03	8.30E-04	1.00E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 19.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Holland Water Department, Holland, Dubois County, Indiana					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	5.50E-06	3.90E-06	4.20E-06
5%	8.00E-06	1.70E-05	9.20E-06	5.50E-06	6.00E-06
10%	8.00E-06	1.90E-05	1.10E-05	6.70E-06	7.40E-06
25%	2.10E-05	2.30E-05	1.40E-05	9.60E-06	1.10E-05
50%	5.00E-05	3.40E-05	2.20E-05	1.70E-05	2.00E-05
75%	1.40E-04	6.80E-05	5.00E-05	4.30E-05	4.90E-05
90%	4.50E-04	1.80E-04	1.40E-04	1.30E-04	1.50E-04
95%	9.50E-04	3.40E-04	2.70E-04	2.50E-04	2.70E-04
99%	2.20E-03	7.20E-04	6.00E-04	4.80E-04	5.00E-04
99.9%	2.90E-03	1.30E-03	1.20E-03	7.40E-04	9.50E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 19.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Holland Water Department, Holland, Dubois County, Indiana					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.10E-05
5%					2.00E-05
10%					2.50E-05
25%					3.70E-05
50%					5.50E-05
75%					7.70E-05
90%					1.00E-04
95%					1.30E-04
99%					1.60E-04
99.9%					1.80E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 20.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

North Vernon Water Department, North Vernon, Jennings County, Indiana					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.60E-06	
5%				4.70E-06	
10%				5.60E-06	
25%				7.60E-06	
50%				1.10E-05	
75%				3.20E-05	
90%				1.10E-04	
95%				1.70E-04	
99%				5.10E-04	
99.9%				1.10E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 20.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

North Vernon Water Department, North Vernon, Jennings County, Indiana					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	4.80E-06	3.60E-06	3.90E-06
5%	8.00E-06	1.60E-05	8.70E-06	4.90E-06	5.40E-06
10%	8.00E-06	1.80E-05	1.00E-05	5.80E-06	6.40E-06
25%	1.80E-05	2.20E-05	1.30E-05	8.00E-06	8.80E-06
50%	3.90E-05	2.80E-05	1.80E-05	1.20E-05	1.50E-05
75%	1.00E-04	6.00E-05	4.30E-05	4.00E-05	4.40E-05
90%	4.00E-04	1.60E-04	1.20E-04	1.20E-04	1.20E-04
95%	7.40E-04	2.70E-04	2.10E-04	1.80E-04	2.00E-04
99%	1.90E-03	6.60E-04	5.50E-04	4.60E-04	5.30E-04
99.9%	3.70E-03	1.60E-03	1.30E-03	8.10E-04	1.00E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 20.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

North Vernon Water Department, North Vernon, Jennings County, Indiana					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	5.10E-06	3.80E-06	4.00E-06
5%	8.00E-06	1.70E-05	9.00E-06	5.10E-06	5.70E-06
10%	8.00E-06	1.90E-05	1.00E-05	6.20E-06	6.80E-06
25%	1.90E-05	2.20E-05	1.30E-05	8.60E-06	9.60E-06
50%	4.50E-05	3.00E-05	2.00E-05	1.40E-05	1.70E-05
75%	1.20E-04	7.40E-05	5.30E-05	5.30E-05	5.70E-05
90%	4.90E-04	1.90E-04	1.40E-04	1.30E-04	1.40E-04
95%	7.70E-04	2.80E-04	2.30E-04	1.90E-04	2.10E-04
99%	1.40E-03	5.40E-04	4.60E-04	3.30E-04	3.70E-04
99.9%	2.10E-03	8.70E-04	8.10E-04	5.30E-04	7.30E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 20.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

North Vernon Water Department, North Vernon, Jennings County, Indiana					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	5.00E-06	3.70E-06	3.90E-06
5%	8.00E-06	1.70E-05	9.00E-06	5.00E-06	5.50E-06
10%	8.00E-06	1.90E-05	1.00E-05	6.00E-06	6.60E-06
25%	1.90E-05	2.20E-05	1.30E-05	8.50E-06	9.60E-06
50%	4.40E-05	3.10E-05	2.00E-05	1.50E-05	1.80E-05
75%	1.30E-04	6.70E-05	4.80E-05	4.50E-05	4.90E-05
90%	3.80E-04	1.60E-04	1.20E-04	1.10E-04	1.20E-04
95%	7.00E-04	2.60E-04	2.00E-04	1.80E-04	2.00E-04
99%	1.60E-03	6.00E-04	4.80E-04	3.90E-04	4.30E-04
99.9%	2.70E-03	1.00E-03	8.50E-04	6.80E-04	8.20E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 20.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

North Vernon Water Department, North Vernon, Jennings County, Indiana					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.00E-05
5%					1.70E-05
10%					2.20E-05
25%					3.20E-05
50%					4.70E-05
75%					6.50E-05
90%					8.80E-05
95%					1.10E-04
99%					1.40E-04
99.9%					1.50E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 21.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Batesville Water Utility, Batesville, Ripley County, Indiana					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.60E-06	
5%				5.60E-06	
10%				7.40E-06	
25%				1.40E-05	
50%				3.60E-05	
75%				8.50E-05	
90%				1.70E-04	
95%				2.50E-04	
99%				4.80E-04	
99.9%				8.00E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 21.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Batesville Water Utility, Batesville, Ripley County, Indiana					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.40E-06	4.10E-06	4.60E-06
5%	8.00E-06	1.80E-05	1.00E-05	6.00E-06	6.80E-06
10%	8.00E-06	2.10E-05	1.20E-05	7.90E-06	8.80E-06
25%	3.00E-05	3.00E-05	1.90E-05	1.50E-05	1.70E-05
50%	9.60E-05	5.70E-05	4.00E-05	3.80E-05	4.20E-05
75%	2.90E-04	1.20E-04	9.10E-05	8.40E-05	9.20E-05
90%	6.40E-04	2.40E-04	1.90E-04	1.60E-04	1.70E-04
95%	9.60E-04	3.60E-04	2.80E-04	2.40E-04	2.60E-04
99%	2.10E-03	7.00E-04	5.70E-04	4.70E-04	5.20E-04
99.9%	3.20E-03	1.30E-03	1.10E-03	7.70E-04	9.00E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 21.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Batesville Water Utility, Batesville, Ripley County, Indiana					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.50E-06	4.10E-06	4.70E-06
5%	8.00E-06	1.80E-05	1.00E-05	6.30E-06	6.90E-06
10%	8.00E-06	2.10E-05	1.20E-05	8.20E-06	9.20E-06
25%	3.10E-05	3.00E-05	1.90E-05	1.60E-05	1.80E-05
50%	9.90E-05	5.80E-05	4.10E-05	3.80E-05	4.30E-05
75%	2.90E-04	1.20E-04	9.20E-05	8.40E-05	9.10E-05
90%	6.10E-04	2.30E-04	1.80E-04	1.60E-04	1.70E-04
95%	9.40E-04	3.40E-04	2.70E-04	2.30E-04	2.60E-04
99%	2.00E-03	7.20E-04	5.60E-04	4.70E-04	5.10E-04
99.9%	3.30E-03	1.20E-03	1.00E-03	7.80E-04	9.00E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 21.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Batesville Water Utility, Batesville, Ripley County, Indiana					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	6.60E-06	4.30E-06	4.80E-06
5%	8.00E-06	1.90E-05	1.00E-05	6.50E-06	7.30E-06
10%	8.00E-06	2.20E-05	1.30E-05	8.60E-06	9.90E-06
25%	3.40E-05	3.20E-05	2.10E-05	1.70E-05	2.00E-05
50%	1.10E-04	6.10E-05	4.40E-05	4.20E-05	4.50E-05
75%	3.10E-04	1.20E-04	9.40E-05	8.60E-05	9.20E-05
90%	6.00E-04	2.30E-04	1.80E-04	1.50E-04	1.70E-04
95%	8.80E-04	3.20E-04	2.60E-04	2.20E-04	2.50E-04
99%	1.80E-03	6.10E-04	5.00E-04	4.30E-04	4.70E-04
99.9%	2.90E-03	1.20E-03	9.80E-04	7.40E-04	8.20E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 21.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Batesville Water Utility, Batesville, Ripley County, Indiana					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.40E-05
5%					2.50E-05
10%					3.20E-05
25%					4.70E-05
50%					7.00E-05
75%					9.90E-05
90%					1.40E-04
95%					1.60E-04
99%					2.10E-04
99.9%					2.40E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 22.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Scottsburg Water Treatment Plant, Scottsburg, Scott County, Indiana					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.80E-06	
5%				4.90E-06	
10%				5.90E-06	
25%				8.20E-06	
50%				1.60E-05	
75%				4.40E-05	
90%				1.30E-04	
95%				2.50E-04	
99%				5.50E-04	
99.9%				8.90E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 22.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Scottsburg Water Treatment Plant, Scottsburg, Scott County, Indiana					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	4.80E-06	3.90E-06	4.10E-06
5%	8.00E-06	1.70E-05	9.00E-06	5.10E-06	5.60E-06
10%	8.00E-06	1.90E-05	1.00E-05	6.10E-06	6.70E-06
25%	2.00E-05	2.30E-05	1.30E-05	8.70E-06	1.00E-05
50%	4.70E-05	3.40E-05	2.20E-05	1.70E-05	2.10E-05
75%	1.40E-04	6.90E-05	5.00E-05	4.30E-05	4.80E-05
90%	4.10E-04	1.70E-04	1.40E-04	1.30E-04	1.40E-04
95%	8.70E-04	3.20E-04	2.60E-04	2.40E-04	2.60E-04
99%	2.50E-03	8.40E-04	6.80E-04	5.40E-04	6.00E-04
99.9%	4.00E-03	1.60E-03	1.40E-03	8.70E-04	1.50E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 22.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Scottsburg Water Treatment Plant, Scottsburg, Scott County, Indiana					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	5.10E-06	4.00E-06	4.30E-06
5%	8.00E-06	1.70E-05	9.20E-06	5.40E-06	5.90E-06
10%	8.00E-06	1.90E-05	1.10E-05	6.60E-06	7.20E-06
25%	2.10E-05	2.40E-05	1.40E-05	9.60E-06	1.10E-05
50%	5.30E-05	3.60E-05	2.40E-05	2.00E-05	2.30E-05
75%	1.60E-04	7.30E-05	5.30E-05	4.70E-05	5.20E-05
90%	4.10E-04	1.70E-04	1.30E-04	1.20E-04	1.30E-04
95%	7.80E-04	2.90E-04	2.30E-04	2.00E-04	2.20E-04
99%	2.10E-03	7.10E-04	5.90E-04	4.90E-04	5.50E-04
99.9%	3.90E-03	1.60E-03	1.30E-03	8.70E-04	1.10E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 22.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Scottsburg Water Treatment Plant, Scottsburg, Scott County, Indiana					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	5.10E-06	4.00E-06	4.20E-06
5%	8.00E-06	1.70E-05	9.20E-06	5.50E-06	5.90E-06
10%	8.00E-06	1.90E-05	1.10E-05	6.60E-06	7.30E-06
25%	2.10E-05	2.40E-05	1.40E-05	9.60E-06	1.10E-05
50%	5.20E-05	3.50E-05	2.30E-05	1.80E-05	2.10E-05
75%	1.40E-04	6.80E-05	5.00E-05	4.30E-05	4.90E-05
90%	4.20E-04	1.80E-04	1.30E-04	1.30E-04	1.40E-04
95%	8.40E-04	3.00E-04	2.40E-04	2.30E-04	2.40E-04
99%	2.00E-03	7.30E-04	5.70E-04	4.50E-04	5.20E-04
99.9%	3.10E-03	1.30E-03	1.20E-03	7.30E-04	1.10E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 22.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Scottsburg Water Treatment Plant, Scottsburg, Scott County, Indiana					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.10E-05
5%					1.90E-05
10%					2.50E-05
25%					3.60E-05
50%					5.30E-05
75%					7.50E-05
90%					1.00E-04
95%					1.20E-04
99%					1.60E-04
99.9%					1.80E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 23.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Iberville Water District #3, White Castle, Iberville County, Louisiana					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				4.40E-06	
5%				6.50E-06	
10%				8.40E-06	
25%				1.40E-05	
50%				2.60E-05	
75%				5.60E-05	
90%				1.30E-04	
95%				2.30E-04	
99%				6.30E-04	
99.9%				1.40E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 23.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Iberville Water District #3, White Castle, Iberville County, Louisiana					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.30E-05	6.80E-06	4.70E-06	5.10E-06
5%	8.00E-06	1.90E-05	1.10E-05	7.60E-06	8.50E-06
10%	8.00E-06	2.30E-05	1.30E-05	1.00E-05	1.10E-05
25%	3.30E-05	3.10E-05	2.00E-05	1.60E-05	1.90E-05
50%	9.20E-05	5.00E-05	3.60E-05	3.00E-05	3.40E-05
75%	2.20E-04	9.80E-05	7.50E-05	6.50E-05	7.30E-05
90%	5.30E-04	2.10E-04	1.60E-04	1.40E-04	1.60E-04
95%	9.10E-04	3.40E-04	2.80E-04	2.40E-04	2.70E-04
99%	2.40E-03	8.50E-04	7.10E-04	5.60E-04	6.10E-04
99.9%	4.20E-03	1.80E-03	1.40E-03	9.80E-04	1.40E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 23.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Iberville Water District #3, White Castle, Iberville County, Louisiana					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.60E-05	8.40E-06	5.90E-06	6.60E-06
5%	8.00E-06	2.20E-05	1.20E-05	1.00E-05	1.10E-05
10%	8.00E-06	2.60E-05	1.60E-05	1.40E-05	1.60E-05
25%	4.40E-05	3.80E-05	2.50E-05	2.30E-05	2.50E-05
50%	1.20E-04	6.20E-05	4.50E-05	4.00E-05	4.40E-05
75%	2.70E-04	1.10E-04	8.60E-05	7.50E-05	8.30E-05
90%	5.60E-04	2.20E-04	1.70E-04	1.50E-04	1.70E-04
95%	8.80E-04	3.20E-04	2.60E-04	2.10E-04	2.40E-04
99%	1.60E-03	5.90E-04	4.90E-04	3.40E-04	4.20E-04
99.9%	2.00E-03	8.80E-04	8.10E-04	4.90E-04	8.60E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 23.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Iberville Water District #3, White Castle, Iberville County, Louisiana					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.40E-05	7.60E-06	5.20E-06	5.80E-06
5%	8.00E-06	2.00E-05	1.20E-05	8.70E-06	9.70E-06
10%	8.00E-06	2.40E-05	1.40E-05	1.10E-05	1.30E-05
25%	3.80E-05	3.40E-05	2.20E-05	1.90E-05	2.10E-05
50%	1.10E-04	5.70E-05	4.10E-05	3.50E-05	4.00E-05
75%	2.50E-04	1.10E-04	8.20E-05	7.40E-05	8.10E-05
90%	6.00E-04	2.10E-04	1.70E-04	1.50E-04	1.60E-04
95%	9.00E-04	3.40E-04	2.60E-04	2.20E-04	2.50E-04
99%	1.80E-03	6.80E-04	5.50E-04	4.20E-04	4.80E-04
99.9%	2.80E-03	1.20E-03	1.10E-03	6.30E-04	9.70E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 23.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Iberville Water District #3, White Castle, Iberville County, Louisiana					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.30E-05
5%					2.30E-05
10%					3.00E-05
25%					4.40E-05
50%					6.60E-05
75%					9.20E-05
90%					1.30E-04
95%					1.50E-04
99%					2.00E-04
99.9%					2.20E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 24.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Higginsville Water Treatment Plant, Higginsville, Lafayette County, Missouri					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				4.90E-06	
5%				8.40E-06	
10%				1.20E-05	
25%				2.20E-05	
50%				4.10E-05	
75%				7.40E-05	
90%				1.30E-04	
95%				2.30E-04	
99%				5.50E-04	
99.9%				1.00E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 24.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Higginsville Water Treatment Plant, Higginsville, Lafayette County, Missouri					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.60E-05	8.10E-06	5.40E-06	6.00E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.10E-06	1.10E-05
10%	8.00E-06	2.60E-05	1.60E-05	1.30E-05	1.50E-05
25%	4.50E-05	3.80E-05	2.50E-05	2.40E-05	2.60E-05
50%	1.30E-04	6.40E-05	4.60E-05	4.20E-05	4.60E-05
75%	2.70E-04	1.10E-04	8.50E-05	7.30E-05	8.00E-05
90%	5.00E-04	2.00E-04	1.60E-04	1.30E-04	1.40E-04
95%	7.90E-04	3.20E-04	2.60E-04	2.30E-04	2.50E-04
99%	2.30E-03	8.40E-04	6.90E-04	5.40E-04	6.50E-04
99.9%	4.30E-03	1.80E-03	1.60E-03	1.00E-03	1.60E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 24.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Higginsville Water Treatment Plant, Higginsville, Lafayette County, Missouri					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.60E-05	8.20E-06	5.40E-06	6.10E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.60E-06	1.10E-05
10%	8.00E-06	2.60E-05	1.60E-05	1.40E-05	1.50E-05
25%	4.60E-05	3.90E-05	2.60E-05	2.40E-05	2.70E-05
50%	1.30E-04	6.60E-05	4.70E-05	4.40E-05	4.80E-05
75%	2.80E-04	1.10E-04	8.80E-05	7.60E-05	8.30E-05
90%	5.10E-04	2.00E-04	1.60E-04	1.30E-04	1.50E-04
95%	8.30E-04	3.20E-04	2.60E-04	2.30E-04	2.50E-04
99%	2.40E-03	7.50E-04	6.00E-04	4.80E-04	5.30E-04
99.9%	3.20E-03	1.30E-03	1.20E-03	7.80E-04	1.20E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 24.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Higginsville Water Treatment Plant, Higginsville, Lafayette County, Missouri					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.60E-05	8.30E-06	5.50E-06	6.00E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.10E-06	1.10E-05
10%	8.00E-06	2.60E-05	1.50E-05	1.30E-05	1.40E-05
25%	4.30E-05	3.70E-05	2.40E-05	2.20E-05	2.50E-05
50%	1.20E-04	6.20E-05	4.50E-05	4.10E-05	4.50E-05
75%	2.70E-04	1.10E-04	8.20E-05	7.00E-05	7.70E-05
90%	4.80E-04	1.90E-04	1.50E-04	1.20E-04	1.40E-04
95%	7.80E-04	3.00E-04	2.40E-04	2.10E-04	2.50E-04
99%	2.60E-03	8.50E-04	6.70E-04	5.70E-04	5.90E-04
99.9%	4.30E-03	1.60E-03	1.40E-03	9.40E-04	1.20E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 24.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Higginsville Water Treatment Plant, Higginsville, Lafayette County, Missouri					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.40E-05
5%					2.50E-05
10%					3.20E-05
25%					4.80E-05
50%					7.10E-05
75%					1.00E-04
90%					1.40E-04
95%					1.70E-04
99%					2.10E-04
99.9%					2.40E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 25.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Bucklin Water Department, Linn County, Missouri					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.60E-06	
5%				4.80E-06	
10%				5.70E-06	
25%				7.70E-06	
50%				1.20E-05	
75%				2.00E-05	
90%				9.40E-05	
95%				2.10E-04	
99%				4.50E-04	
99.9%				7.30E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 25.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Bucklin Water Department, Linn County, Missouri					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.00E-05	4.90E-06	3.70E-06	4.00E-06
5%	8.00E-06	1.40E-05	8.40E-06	4.90E-06	5.40E-06
10%	8.00E-06	1.80E-05	1.00E-05	5.80E-06	6.50E-06
25%	1.70E-05	2.10E-05	1.20E-05	7.90E-06	9.00E-06
50%	3.70E-05	2.70E-05	1.70E-05	1.20E-05	1.40E-05
75%	7.50E-05	4.00E-05	2.90E-05	2.10E-05	2.50E-05
90%	2.60E-04	1.30E-04	9.80E-05	9.80E-05	1.10E-04
95%	7.40E-04	2.90E-04	2.30E-04	2.10E-04	2.40E-04
99%	1.80E-03	6.70E-04	5.40E-04	4.30E-04	4.80E-04
99.9%	2.70E-03	1.10E-03	1.10E-03	7.30E-04	9.70E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 25.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Bucklin Water Department, Linn County, Missouri					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	5.00E-06	3.70E-06	4.10E-06
5%	8.00E-06	1.40E-05	8.60E-06	5.00E-06	5.60E-06
10%	8.00E-06	1.80E-05	1.00E-05	5.90E-06	6.60E-06
25%	1.70E-05	2.10E-05	1.20E-05	8.10E-06	9.20E-06
50%	3.80E-05	2.70E-05	1.70E-05	1.20E-05	1.40E-05
75%	7.80E-05	4.20E-05	3.00E-05	2.20E-05	2.70E-05
90%	2.60E-04	1.20E-04	9.60E-05	9.10E-05	1.00E-04
95%	6.60E-04	2.80E-04	2.10E-04	2.00E-04	2.20E-04
99%	1.80E-03	6.60E-04	5.10E-04	4.30E-04	4.80E-04
99.9%	2.90E-03	1.20E-03	1.00E-03	7.30E-04	8.90E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 25.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Bucklin Water Department, Linn County, Missouri					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	4.90E-06	3.70E-06	4.00E-06
5%	8.00E-06	1.40E-05	8.40E-06	5.00E-06	5.50E-06
10%	8.00E-06	1.80E-05	1.00E-05	5.90E-06	6.60E-06
25%	1.70E-05	2.10E-05	1.20E-05	7.90E-06	9.10E-06
50%	3.70E-05	2.70E-05	1.70E-05	1.20E-05	1.40E-05
75%	7.30E-05	4.00E-05	2.80E-05	2.00E-05	2.50E-05
90%	2.70E-04	1.30E-04	9.70E-05	1.00E-04	1.10E-04
95%	7.10E-04	2.70E-04	2.10E-04	2.00E-04	2.20E-04
99%	1.70E-03	6.10E-04	4.60E-04	3.90E-04	4.40E-04
99.9%	2.70E-03	1.10E-03	1.10E-03	5.80E-04	1.10E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 25.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Bucklin Water Department, Linn County, Missouri					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					9.30E-06
5%					1.50E-05
10%					1.90E-05
25%					2.70E-05
50%					3.90E-05
75%					5.40E-05
90%					7.30E-05
95%					8.80E-05
99%					1.10E-04
99.9%					1.30E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 26.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Vandalia Water Treatment Plant, Vandalia, Audrain County, Missouri					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				4.80E-06	
5%				7.90E-06	
10%				1.10E-05	
25%				1.80E-05	
50%				4.60E-05	
75%				9.80E-05	
90%				1.80E-04	
95%				2.70E-04	
99%				6.30E-04	
99.9%				1.20E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 26.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Vandalia Water Treatment Plant, Vandalia, Audrain County, Missouri					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.50E-05	7.80E-06	5.40E-06	6.50E-06
5%	8.00E-06	2.10E-05	1.20E-05	9.50E-06	1.10E-05
10%	8.00E-06	2.60E-05	1.50E-05	1.30E-05	1.40E-05
25%	4.70E-05	3.80E-05	2.50E-05	2.20E-05	2.50E-05
50%	1.30E-04	6.90E-05	5.10E-05	4.80E-05	5.30E-05
75%	3.50E-04	1.40E-04	1.10E-04	9.60E-05	1.00E-04
90%	6.90E-04	2.60E-04	2.10E-04	1.80E-04	2.00E-04
95%	1.10E-03	3.90E-04	3.20E-04	2.70E-04	3.00E-04
99%	2.50E-03	8.30E-04	7.20E-04	5.50E-04	7.00E-04
99.9%	4.80E-03	1.70E-03	1.50E-03	1.00E-03	1.50E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 26.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Vandalia Water Treatment Plant, Vandalia, Audrain County, Missouri					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.70E-05	8.90E-06	6.00E-06	7.30E-06
5%	8.00E-06	2.30E-05	1.30E-05	1.10E-05	1.30E-05
10%	8.00E-06	2.80E-05	1.70E-05	1.60E-05	1.80E-05
25%	5.50E-05	4.30E-05	2.90E-05	2.70E-05	3.00E-05
50%	1.50E-04	7.50E-05	5.50E-05	5.10E-05	5.60E-05
75%	3.60E-04	1.40E-04	1.10E-04	1.00E-04	1.10E-04
90%	7.20E-04	2.60E-04	2.10E-04	1.80E-04	2.00E-04
95%	1.00E-03	3.80E-04	3.00E-04	2.50E-04	2.80E-04
99%	1.80E-03	7.00E-04	5.50E-04	4.20E-04	4.90E-04
99.9%	2.80E-03	1.20E-03	9.70E-04	6.40E-04	1.10E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 26.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Vandalia Water Treatment Plant, Vandalia, Audrain County, Missouri					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.60E-05	8.30E-06	5.80E-06	6.40E-06
5%	8.00E-06	2.20E-05	1.20E-05	9.80E-06	1.10E-05
10%	8.00E-06	2.70E-05	1.60E-05	1.40E-05	1.60E-05
25%	4.90E-05	4.00E-05	2.70E-05	2.40E-05	2.80E-05
50%	1.40E-04	7.20E-05	5.20E-05	4.90E-05	5.40E-05
75%	3.40E-04	1.30E-04	1.00E-04	9.30E-05	1.00E-04
90%	6.60E-04	2.60E-04	2.00E-04	1.80E-04	2.00E-04
95%	1.10E-03	3.80E-04	3.10E-04	2.70E-04	2.90E-04
99%	2.00E-03	7.00E-04	6.10E-04	4.50E-04	5.20E-04
99.9%	2.70E-03	1.10E-03	1.00E-03	6.90E-04	1.10E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 26.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Vandalia Water Treatment Plant, Vandalia, Audrain County, Missouri					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.50E-05
5%					2.80E-05
10%					3.70E-05
25%					5.60E-05
50%					8.30E-05
75%					1.20E-04
90%					1.60E-04
95%					2.00E-04
99%					2.50E-04
99.9%					2.80E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 27.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Sardinia Water Treatment Plant, Sardinia, Brown County, Ohio					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.90E-06	
5%				5.40E-06	
10%				6.50E-06	
25%				9.30E-06	
50%				1.60E-05	
75%				2.90E-05	
90%				6.30E-05	
95%				1.40E-04	
99%				1.20E-03	
99.9%				2.20E-03	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 27.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Sardinia Water Treatment Plant, Sardinia, Brown County, Ohio					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	5.40E-06	3.90E-06	4.20E-06
5%	8.00E-06	1.70E-05	9.00E-06	5.50E-06	6.20E-06
10%	8.00E-06	1.90E-05	1.10E-05	6.80E-06	7.60E-06
25%	2.10E-05	2.30E-05	1.40E-05	9.60E-06	1.10E-05
50%	4.80E-05	3.20E-05	2.10E-05	1.60E-05	1.90E-05
75%	1.10E-04	5.20E-05	3.70E-05	3.00E-05	3.40E-05
90%	2.20E-04	9.80E-05	7.60E-05	6.20E-05	7.10E-05
95%	5.20E-04	2.30E-04	1.90E-04	1.80E-04	1.90E-04
99%	4.70E-03	1.50E-03	1.30E-03	1.10E-03	1.20E-03
99.9%	9.30E-03	3.80E-03	3.00E-03	2.10E-03	2.60E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	99.98%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 27.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Sardinia Water Treatment Plant, Sardinia, Brown County, Ohio					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	5.70E-06	4.10E-06	4.40E-06
5%	8.00E-06	1.80E-05	9.30E-06	5.80E-06	6.50E-06
10%	8.00E-06	2.00E-05	1.10E-05	7.20E-06	8.00E-06
25%	2.20E-05	2.40E-05	1.50E-05	1.10E-05	1.20E-05
50%	5.40E-05	3.50E-05	2.30E-05	1.90E-05	2.20E-05
75%	1.30E-04	5.90E-05	4.30E-05	3.50E-05	3.90E-05
90%	2.90E-04	1.20E-04	9.30E-05	8.30E-05	9.40E-05
95%	6.80E-04	2.80E-04	2.40E-04	2.30E-04	2.50E-04
99%	4.00E-03	1.30E-03	1.00E-03	8.50E-04	9.30E-04
99.9%	6.30E-03	2.60E-03	2.40E-03	1.40E-03	1.90E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 27.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Sardinia Water Treatment Plant, Sardinia, Brown County, Ohio					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.20E-05	5.50E-06	4.00E-06	4.30E-06
5%	8.00E-06	1.70E-05	9.10E-06	5.70E-06	6.50E-06
10%	8.00E-06	1.90E-05	1.10E-05	7.00E-06	8.00E-06
25%	2.10E-05	2.40E-05	1.40E-05	1.00E-05	1.20E-05
50%	5.10E-05	3.30E-05	2.20E-05	1.70E-05	2.00E-05
75%	1.10E-04	5.30E-05	3.80E-05	3.00E-05	3.40E-05
90%	2.10E-04	9.30E-05	7.30E-05	5.90E-05	6.70E-05
95%	4.20E-04	1.90E-04	1.50E-04	1.40E-04	1.60E-04
99%	4.20E-03	1.50E-03	1.10E-03	1.00E-03	1.10E-03
99.9%	7.50E-03	3.00E-03	2.80E-03	1.80E-03	2.30E-03
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 27.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Sardinia Water Treatment Plant, Sardinia, Brown County, Ohio					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					1.20E-05
5%					2.10E-05
10%					2.60E-05
25%					3.90E-05
50%					5.80E-05
75%					8.10E-05
90%					1.10E-04
95%					1.30E-04
99%					1.70E-04
99.9%					1.90E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%

Table 28.1 Probabilistic assessment of the dose from drinking water and dietary exposure using the daily drinking water concentration

Newark Water Works, Newark, Licking County, Ohio					
Percentage	Acute Dose = Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%				3.60E-06	
5%				4.80E-06	
10%				5.60E-06	
25%				7.50E-06	
50%				1.10E-05	
75%				2.10E-05	
90%				7.50E-05	
95%				1.30E-04	
99%				3.10E-04	
99.9%				9.20E-04	
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
				100.00%	
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 28.2 Probabilistic assessment of the dose from drinking water and dietary exposure using the monthly average daily drinking water concentration

Newark Water Works, Newark, Licking County, Ohio					
Percentage	Short-Term Dose = Monthly Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	5.00E-06	3.60E-06	3.90E-06
5%	8.00E-06	1.50E-05	8.60E-06	4.90E-06	5.30E-06
10%	8.00E-06	1.80E-05	1.00E-05	5.80E-06	6.30E-06
25%	1.70E-05	2.10E-05	1.20E-05	7.70E-06	8.60E-06
50%	3.50E-05	2.70E-05	1.70E-05	1.10E-05	1.30E-05
75%	7.50E-05	4.40E-05	3.20E-05	2.50E-05	3.00E-05
90%	2.70E-04	1.10E-04	8.90E-05	8.10E-05	9.00E-05
95%	5.20E-04	2.00E-04	1.50E-04	1.40E-04	1.50E-04
99%	1.10E-03	4.00E-04	3.00E-04	2.60E-04	2.80E-04
99.9%	2.10E-03	7.40E-04	6.20E-04	4.40E-04	6.20E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 28.3 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec)

Newark Water Works, Newark, Licking County, Ohio					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Jan/Mar, Apr/Jun, Jul/Sep, Oct/Dec				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	5.00E-06	3.70E-06	4.00E-06
5%	8.00E-06	1.50E-05	9.00E-06	5.00E-06	5.50E-06
10%	8.00E-06	1.80E-05	1.00E-05	5.90E-06	6.40E-06
25%	1.70E-05	2.10E-05	1.30E-05	8.00E-06	8.90E-06
50%	3.80E-05	2.80E-05	1.80E-05	1.20E-05	1.40E-05
75%	8.50E-05	4.80E-05	3.40E-05	2.80E-05	3.30E-05
90%	2.80E-04	1.20E-04	8.90E-05	8.40E-05	9.10E-05
95%	5.20E-04	1.90E-04	1.50E-04	1.30E-04	1.40E-04
99%	1.00E-03	3.40E-04	2.90E-04	2.30E-04	2.50E-04
99.9%	1.30E-03	5.80E-04	5.60E-04	3.30E-04	4.90E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 28.4 Probabilistic assessment of the dose from drinking water and dietary exposure using the quarterly average daily drinking water concentration (Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan)

Newark Water Works, Newark, Licking County, Ohio					
Percentage	Intermediate-Term Dose = Quarterly Average Daily Dose (mg/kg-day) Quarters: Feb/Apr, May/Jul, Aug/Oct, Nov/Jan				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%	8.00E-06	1.10E-05	5.10E-06	3.70E-06	3.90E-06
5%	8.00E-06	1.50E-05	9.00E-06	5.10E-06	5.60E-06
10%	8.00E-06	1.80E-05	1.00E-05	6.00E-06	6.60E-06
25%	1.80E-05	2.20E-05	1.30E-05	8.20E-06	9.10E-06
50%	3.90E-05	2.80E-05	1.80E-05	1.20E-05	1.40E-05
75%	8.10E-05	4.60E-05	3.30E-05	2.50E-05	3.00E-05
90%	2.60E-04	1.20E-04	8.60E-05	8.30E-05	8.80E-05
95%	5.00E-04	1.90E-04	1.50E-04	1.20E-04	1.40E-04
99%	9.40E-04	3.20E-04	2.80E-04	2.10E-04	2.40E-04
99.9%	1.20E-03	5.10E-04	4.80E-04	3.20E-04	5.30E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
	100.00%	100.00%	100.00%	100.00%	100.00%
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018

Table 28.5 Probabilistic assessment of the dose from drinking water and dietary exposure using the chronic average daily drinking water concentration

Newark Water Works, Newark, Licking County, Ohio					
Percentage	Chronic Dose = Chronic Average Daily Dose (mg/kg-day)				
	Infants	Children 1 to 6	Children 7 to 12	Adults 13 to 50	General Population
1%					8.40E-06
5%					1.30E-05
10%					1.60E-05
25%					2.20E-05
50%					3.20E-05
75%					4.40E-05
90%					5.90E-05
95%					7.10E-05
99%					9.10E-05
99.9%					1.00E-04
	Percentage Below Specified RfD (mg/kg-day)				
Acute	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01	RfD=0.01
Short-Term	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Intermediate	RfD=0.013	RfD=0.0063	RfD=0.0063	RfD=0.005	RfD=0.005
Chronic	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018	RfD=0.0018
					100.00%